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In Brief: Barclays Bond-Level Liquidity Measure – LCS®

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Liquidity is one of the most important, and widely used, characteristics of any market. Yet it means different things to different people and in different contexts. What's more, popular definitions of liquidity usually are difficult to quantify rigorously. Metrics that do exist are often market aggregates, eg, total trading volume, the number of bonds traded, and dealer inventories. However, a truly useful liquidity measure must be security-level. It can still be aggregated to market level, with an added advantage of flexibility in defining the "market." More importantly, it must allow one to measure and manage the liquidity of any particular bond portfolio. It also makes it easy to factor liquidity into a multitude of investment decisions: for example, selecting a bond universe for portfolio rebalancing, monitoring desk inventories, testing the feasibility of alpha strategies, and quantifying liquidity risk.

In 2009, Barclays launched a bond-level liquidity measure, Liquidity Cost Score (LCS), which focuses on cost of trading, arguably the most important dimension of liquidity. More specifically, LCS measures the cost of an immediate, round-trip transaction of a typical institutional size and is expressed as a percent of the bond's price.

At the time of writing, Barclays computes LCS for more than 20,400 fixed-income securities, with a total outstanding amount of $47trn, covering a broad range of asset classes. Figure 1 shows the current LCS coverage universe.

FIGURE 1
LCS Market Coverage, as of July 2018

Index	Inception Date
USD Credit IG	Jan-07
USD Credit HY	Jan-07
USD IG Credit 144A (no reg rights)	Jan-07
USD Treasuries	Nov-09
USD TIPS	Jul-10
USD Fixed Rate Agency MBS	Mar-10
USD Emerging Markets	Feb-12
Pan Euro Credit IG	May-10
Pan Euro Credit HY	May-10
Pan Euro Credit FRN	May-10
GBP Corporate £100–200mn	May-10
Pan Euro Agencies	May-10
Pan Euro Local Authorities	May-10
Pan Euro Treasuries	Feb-11
Pan Euro Inflation Linked	Mar-11
Global Covered Bonds	Sep-12
JPY Treasuries	Sep-13

Source: Barclays Research

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Unlike exchange-traded equities, actual bond transaction data are not widely available. Besides, relatively few bonds trade on a daily basis. However, many more are quoted on a daily basis. Accordingly, LCS relies on simultaneous two-way quotes issued by Barclays' traders to other market participants. This data set is quite extensive. Each day, traders post thousands of simultaneous, bond-level quotes for normal institutional transaction amounts. Any particular bank's bid-ask spread is unlikely always to be the "effective" market, ie, the highest bid and the lowest offer across all broker-dealers. As a result, LCS may overstate best-execution transaction costs and should be treated as a conservative measure. However, given Barclays' material presence in fixed-income markets, most of the time bid-ask quotes are not far from market levels, especially when averaged over time.

Bonds are quoted on either spread or price; therefore, LCS can be expressed in one of the two, conceptually identical, ways:

$$LCS = (Bid\ spread - Ask\ spread)\ x\ OASD^{1}$$

$$LCS = \frac{Ask\ price - Bid\ price}{Bid\ \ price}$$

Trader quotes, collected on a daily basis, form the principal input into our proprietary LCS methodology. The modelling component of this methodology (tailored to different asset classes) deals primarily with two issues. The reliability of trader quotes may be uneven across bonds. Very actively traded issues are likely to be quoted at executable levels and uniformly among broker-dealers. For less liquid bonds, traders may issue bid-ask indications, not necessarily executable (more often in the US than in Europe). To distinguish between the two, the LCS methodology uses market-specific algorithms based on multiple criteria, such as a bond's age, issue size, and trading volume, among others. The model widens quotes considered indicative to ensure they are not too narrow compared with the "true" market. It never tightens bid-ask spreads, in the spirit of keeping LCS a conservative measure.

The second part of the LCS model deals with bonds that have no two-way trader quotes in a particular month. Such bonds are a minority in most markets. However, to achieve the full coverage of relevant markets (as defined by widely used market indices), bid-ask spreads of such bonds must be estimated. The methodology (again, customized to different asset classes) relies on regression-based econometric models to establish a relationship between "observed" LCS computed directly from traders' quotes and various intuitive bond attributes, eg, issue size, sector, and trading volume.[2] It is reasonable to assume that the same relationship holds for bonds not quoted in a particular month. Hence, the established relationship is used to estimate LCS of non-quoted bonds by applying the regression coefficients, calibrated to the universe of quoted bonds, to the relevant attributes of non-quoted bonds. The estimated LCS is then adjusted higher, to reflect the non-quoted status of a bond. The model includes a smoothing mechanism that takes into account whether a bond was quoted in previous months, among other factors. This prevents large, unjustified jumps in LCS values.

Most attributes used in the LCS models are what investors would look at when trying to gauge a bond's liquidity. For example, recent and large issues are usually cheaper to trade than seasoned and small ones, so bond age and issue size must be important. Still, however intuitive an attribute seems, we always seek empirical confirmation, illustrated by the next few figures. For example, Figure 2 segments the universe of trader-quoted credit bonds by age and issue size while controlling for maturity (hence, four tables). Two clear gradients emerge: LCS decreases for smaller issues and, with a few exceptions, increases for older bonds, so there was a strong case for including these two attributes in the model.

[1] Option-adjusted spread duration.
[2] See *Measuring Bond-Level Liquidity: Liquidity Cost Scores (LCS)*,Barclays Cross Asset Research, July 2015 (available to the LCS Analytics Package subscribers).

FIGURE 2

Average LCS by Issue Size and Age, USD Investment Grade Credit, July 2018

Maturity: 1-5 (40.3% MV)

Size, $mn	Age, yr <1	1-5	5-7.5	7.5+
<500	0.40	0.38	0.50	0.35
500-750	0.30	0.30	0.42	0.28
750-1,500	0.23	0.24	0.36	0.24
1,500-2,000	0.18	0.18	0.34	0.21
2,000-3,000	0.15	0.18	0.31	0.17
>3,000	0.17	0.17	0.21	

Maturity: 5-10 (29.2% MV)

Size, $mn	Age, yr <1	1-5	5-7.5	7.5+
<500	0.76	0.72		0.87
500-750	0.58	0.64	0.58	0.77
750-1,500	0.45	0.49	0.45	0.54
1,500-2,000	0.35	0.39		
2,000-3,000	0.31	0.39		
>3,000	0.28	0.31		

Maturity: 10+ (30.5% MV)

Size, $mn	Age, yr <1	1-5	5-7.5	7.5+
<500	1.27	1.58	1.48	1.21
500-750	1.10	1.38	1.37	1.17
750-1,500	0.88	1.10	1.18	1.13
1,500-2,000	0.76	0.94	1.23	0.99
2,000-3,000	0.69	0.88		0.87
>3,000	0.53	0.75		

Maturity: All

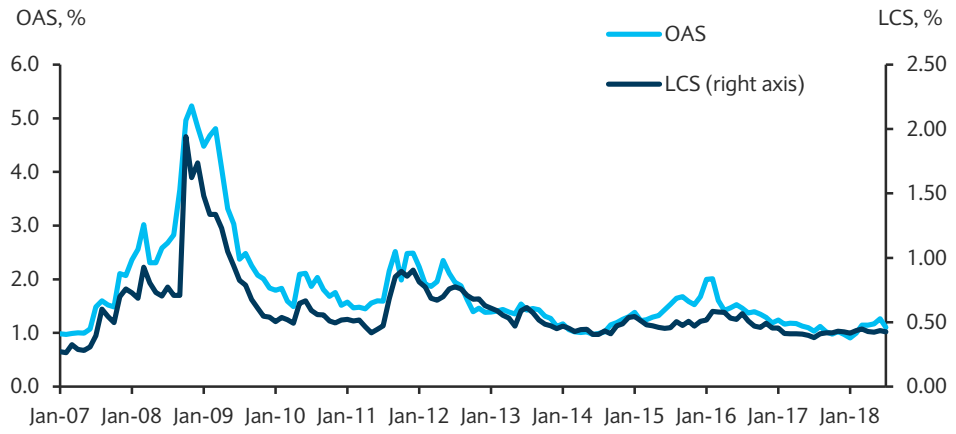
Size, $mn	Age, yr <1	1-5	5-7.5	7.5+
<500	0.82	0.89	0.84	0.99
500-750	0.60	0.73	0.75	0.81
750-1,500	0.45	0.50	0.61	0.78
1,500-2,000	0.41	0.41	0.59	0.71
2,000-3,000	0.32	0.44	0.41	0.67
>3,000	0.28	0.34	0.34	0.56

Note: Buckets with fewer than 10 bonds are not shown. Source: Barclays Research

Another "common-sense" liquidity driver is spread. Figure 3 demonstrates the stability and strength of this relationship.

FIGURE 3

LCS versus OAS, Trader-Quoted USD Investment Grade Corporates, January 2007-July 2018

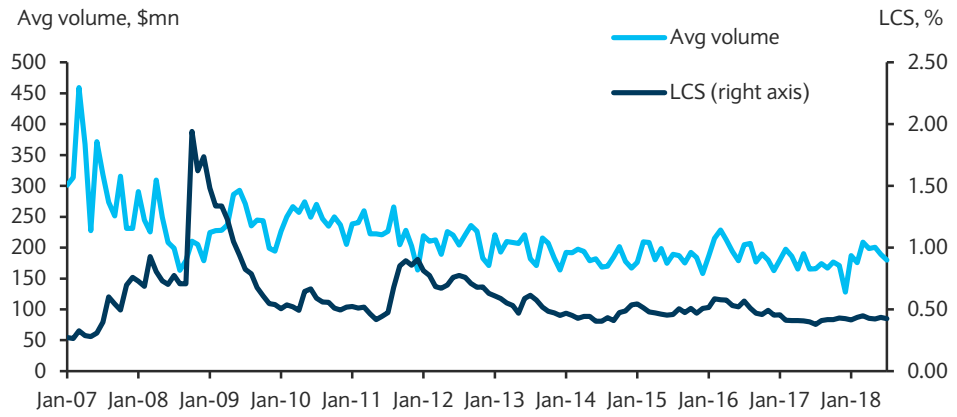


Source: Barclays Research

Not all seemingly intuitive attributes are necessarily highly correlated with liquidity. One example is trading volume, a popular indicator of market liquidity often used by academics and practitioners alike. Yet when liquidity is defined as cost of trading, one should be careful. We found no discernible relationship (Figure 4) between the two – most of the time. In fact, even though one would assume volume and LCS to be negatively correlated, they occasionally move in concert. Only during the credit crisis of 2008-09 did LCS and trading volume exhibit a clear negative relationship.

FIGURE 4

LCS versus Trading Volume, Trader-Quoted USD Investment Grade Corporates, January 2007-July 2018



Source: Barclays Research

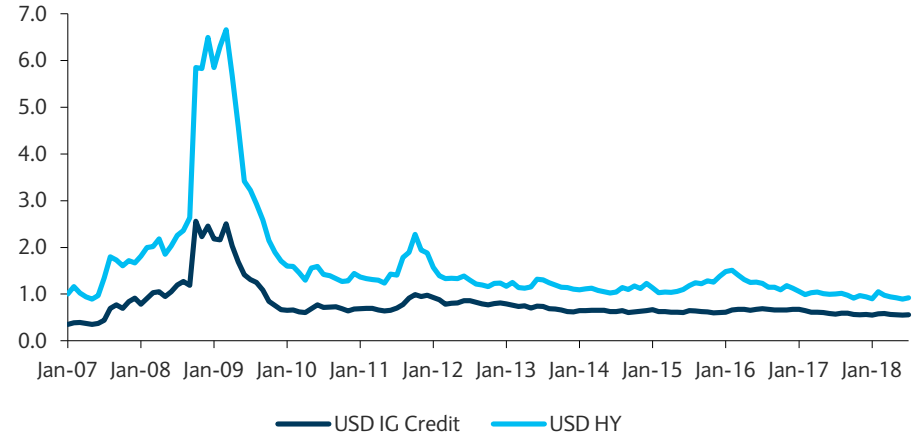
Applications of LCS

LCS is used by a number of asset managers, plan sponsors, and regulators, for a variety of purposes. We provide several examples pertaining specifically to bond portfolio management.

As mentioned before, a bond-level measure can be used for monitoring and analyzing market liquidity while allowing full flexibility in defining the universe of interest, from large markets such as USD credit to very narrowly defined market segments suited for some particular inquiry. Investors often compare today's liquidity environment with various periods in the past. Aggregated to market level, LCS makes such comparisons rigorous, replacing qualitative opinions, often unsupported by evidence, with hard numbers. This is one of the reasons we have seen interest in LCS from regulators and central banks. Figure 5 shows historical LCS for USD investment grade and high yield credit.

FIGURE 5

Time Series of USD Investment Grade and High Yield Credit LCS, %, January 2007-July 2018



Source: Barclays Research

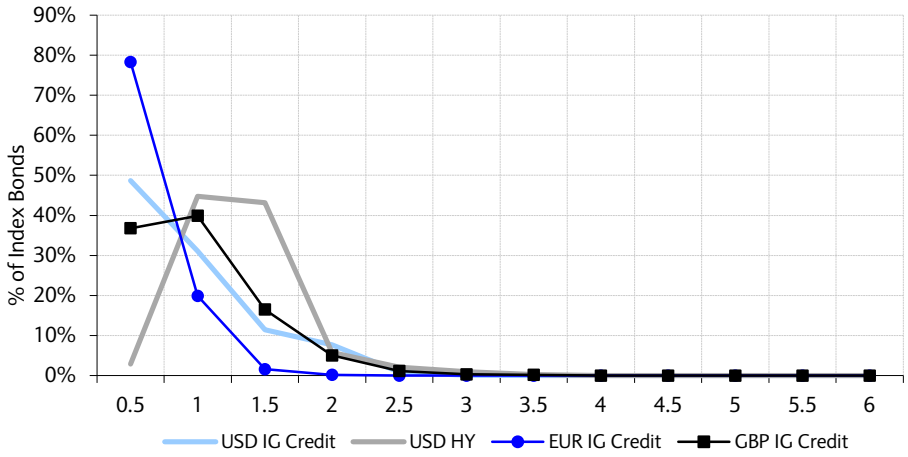
Contemporaneous, cross-sectional market analysis can be as illuminating as historical patterns. An intra-market distribution of LCS contains valuable information about market conditions, beyond simple statistics such as a market value-weighted average or median.

Side-by-side distributions for different markets highlight differences between their liquidity conditions. Figure 6 shows July 2018 cross-sectional distributions of LCS for four major credit markets: USD investment grade and high yield, EUR investment grade, and GBP investment grade. EUR investment grade credit, for example, is not only the most liquid on average, but is heavily concentrated, with 99% of bonds with an LCS below 1.0. On the other hand, USD high yield is not only the least liquid market in terms of LCS levels, but has the fattest tail as well.

Cross-sectional distributions for the same market at different points in time can be equally instructive. Figure 7, for example, shows cross-sectional distributions for two very different market environments: the pre-crisis month of July 2007, widely considered a time of very good market liquidity, and the turbulent November 2008. Today's liquidity conditions lie between these two extremes.

FIGURE 6

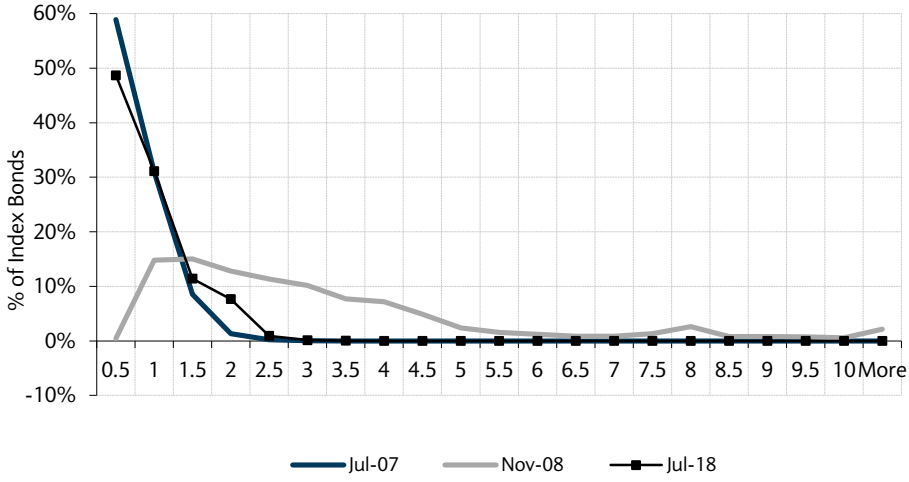
Cross-Sectional LCS Frequency Distribution, July 2018



Source: Barclays Research

FIGURE 7

Historical Comparisons of Cross-Sectional LCS Frequency Distribution for USD Investment Grade Credit



Source: Barclays Research

A bond-level liquidity measure is useful for portfolio structuring and benchmark replication with liquid securities. One of the challenges of managing a portfolio with a limited number of bonds against a broad market index is narrowing down the investable universe. A portfolio manager cannot evaluate thousands of bonds and must impose some selection constraints. Obviously, liquidity is always among them. Without a bond-level measure, one has to use multiple, indirect proxies for liquidity. Having one number for every bond in the index streamlines this process and makes it more robust. Once a liquid investable universe is in place, the manager can proceed to construct or rebalance a replicating portfolio without worrying about the feasibility of its implementation.

Some other applications of LCS, not covered in this brief abstract, include analyzing liquidity risk; the liquidity adjustment of VaR models; decomposing a bond's spread into risk premium, default, and liquidity components;[3] and intra-market relative measures of liquidity.

LCS adds to bond investors' toolbox an objective and quantitative way to measure individual bonds' liquidity. A few LCS applications described here illustrate how fixed-income portfolio managers use this measure. LCS also provides valuable current and historical data for academics and policy makers studying and monitoring liquidity in bond markets.

[3] See *Decomposing Bond-Level Credit OAS into Default and Liquidity Components*, Barclays Cross Asset Research, July 2010 (available to the LCS Analytics Package subscribers)

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