IHS Markit™

The changing fixed income landscape

Examining liquidity and transaction cost dispersion

The evolution of the fixed income market place

Since the financial crisis, the fixed income market has experienced a number of significant changes. On the one hand, bond market liquidity seemingly dried up as the Volcker rule heavily discouraged principal-based dealing by banks who were substantial liquidity providers prior the crisis. On the other hand, markets for certain instruments evolved to incorporate electronic trading, while various ATS (alternative trading systems) began to flourish. Additionally, the recent prosperity of private credit markets (especially in the United States) seems to have raised concern that the public debt markets may function below optimum to provide funding to the economy.

In foreseeing the fixed income market's evolution to become more data-driven and transparent, fixed income transaction cost analysis ("FI TCA") solutions have developed in tandem. This piece explores the transaction costs associated with the global fixed income markets and examines the liquidity landscape of different geographical regions and fixed income instrument types.

The fixed income market has undergone significant change since the financial crisis

Trend tracking in transaction cost analysis

As a provider of a fixed income transaction cost analysis product since 2015, IHS Markit is often peppered with questions regarding the patterns seen with associated costs over time, the relationships between spread size and liquidity, and the extent to which deal size impacts trading costs. To this end, we have studied a large sample of fixed income data using transactions that took place between January 1st, 2016 and June 30th, 2017. The dataset consisted of 288,582 transactions with execution timestamps, at a total market value of US$3.1 trillion. Overall, 56 investment entities have been represented with trading in 37,604 distinct instruments across 38 currencies.

Costs over time, the relationships between spread size, liquidity and deal size are among the most frequently asked questions by TCA users

Liquidity and transaction cost by currency

By currency, we identified the top 3 denominations in our sample were USD, GBP and EUR. Aware of the intricacies of trading in Eurobonds and Foreign Bonds, the decision was taken to use currency denomination as a classification, and grouped the dataset into the following four regional subsets: USD, GBP, EUR and Other. The table below summarizes the liquidity profile and cost distribution for each group.

Table 1: Liquidity and transaction cost by currency

Currency	# of Transactions	Avg Last Mid Slippage (bps)	StdDev Last Mid Slippage	Skewness Last Mid Slippage	Last Mid Slippage First Quartile	Last Mid Slippage Median	Last Mid Slippage Third Quartile	Avg Spread Size (bps)	Spread Size First Quartile	Spread Size Median	Spread Size Third Quartile
USD	146,654	0.61	120.99	0.50	-21.08	-1.32	17.94	22.45	5.69	6.56	25.06
GBP	89,859	-12.60	218.70	-3.75	-29.19	-0.99	24.77	38.53	3.15	5.77	64.01
EUR	40,682	-6.17	122.07	-4.31	-21.93	-2.63	10.17	42.49	6.20	31.75	64.85
Other	21,912	-3.48	210.68	-0.56	-22.27	-1.37	17.21	35.91	8.24	22.19	45.55

Key highlights

- USD denominated bonds have the smallest cost measured by both average of Last Mid Slippage (0.61 bps), and the smallest standard deviation of Last Mid Slippage (120.99 bps). They also have a slight positive skewness (0.5 bps) compared to other groups;
- GBP denominated bonds have the smallest median Last Mid Slippage (-0.99 bps). However they also have a quite large standard deviation of Last Mid Slippage (218.70 bps) compared to USD and EUR denominated bonds;
- EUR denominated bonds have the largest skewness of Last Mid Slippage (-4.31 bps) amongst these groups;

1 Did the Volcker rule really harm the bond market? url: http://www.marketwatch.com/story/does-the-bond-market-really-have-a-liquidity-problem-2015-08-18
2 Electronic trading in fixed income markets, by Bank for International Settlements. URL: http://www.bis.org/publ/mktc07.pdf
3 "ACC Sees Private Credit Market Reaching US$1 Trillion By 2020", by AIMA, URL: https://www.aima.org/uploads/assets/uploaded/5ba093f1-4943-4620-912e8b70ac03d882.pdf
4 US House of Representatives hearing on "Fixed Income Market Structure and the Impact on Capital and Job Growth" URL: https://financials-ervices.house.gov/news/documentsingle.aspx?DocumentID=402153
5 Trading data analyzed from our FI TCA product. See our appendix for more detail on the date and cost methodology.
6 For further details of the data cleaning and selection see appendix section 3.

- On spread size, USD and GBP denominated bonds have the tightest quoted spreads, indicated by their small median spread size (6.56 bps and 5.77 bps respectively);
- EUR denominated bonds have unexpectedly high spread size, exceeding the Other group on both average and median basis.

Asset class liquidity

The natural question to follow on costs by region is whether bond-type (e.g. sovereign, high yield, etc.) is a factor. Conventional wisdom suggests that different classes of bonds are associated with different market structures and liquidity profiles. In this section we further breakdown the above dataset by asset class.

From the table below, EUR contained a much larger percentage of transactions in the high yield sector (11.88%) and less in the sovereign sector (41.31%) compared to GBP and Other. This may explain why, in the previous section, a much larger quote spread size was seen in the EUR category.

Table 2: Number of transactions by currency & asset class

Row Labels	High Grade	High Yield	Other	Sovereign	Structured	UST	Agency	Grand Total
EUR	35.72%	11.88%	9.84%	41.31%	0.50%	0.00%	0.75%	100.00%
GBP	15.91%	2.25%	5.64%	75.39%	0.56%	0.00%	0.26%	100.00%
Other	11.50%	0.29%	7.86%	77.86%	0.03%	0.00%	2.47%	100.00%
USD	20.99%	9.72%	5.50%	5.14%	26.43%	18.98%	13.25%	100.00%
Grand Total	20.77%	7.08%	6.30%	36.50%	13.19%	9.30%	6.85%	100.00%

Further examining the liquidity and cost for each combination, we compiled the following table. It is confirmed that EUR high yield bonds indeed have a relatively large spread size (84.36 bps) compared to EUR sovereigns (5.8 bps), further explaining the unexpected high spread size in the EUR category as a whole.

Key highlights

- US Treasuries (UST) had the narrowest median spread size (1.57 bps) across region and asset class.
- US agencies, structured products, EUR sovereigns and GBP sovereigns all had single-digit (bps) median spread size, indicating strong liquidity.
- GBP-denominated bonds had a relatively large median spread size in the high grade and high yield categories (85.83 bps and 104.64 bps, respectively) compared to the USD and EUR groups.
- USD-denominated sovereign bonds, which are foreign (mostly developing) countries issuing debt in USD, had the largest spread size amongst all Sovereign categories.
- From a cost perspective, many categories had a median close to 0 (low single-digit median Last Mid Slippage in bps).
- One obvious exception from last observation is high yield bonds. Globally, we saw median costs were over -8 bps, with USD high yield having the largest at -11.9 bps.

Table 3: Spread size and last mid slippage by currency & asset class (bps)

	Agency		High Grade		High Yield		Other		Sovereign		Structured		UST	
	Median Spread	Median Cost	Median Spread	Median Cost	Median Spread	Median Cost	Median Spread	Median Cost	Median Spread	Median Cost	Median Spread	Median Cost	Median Spread	Median Cost
EUR	44.80	0.75	43.64	-4.96	84.36	-8.38	58.75	-2.59	5.80	-0.49	19.93	2.75		
GBP	24.84	0.48	85.83	-3.84	104.64	-8.72	82.09	-1.69	4.54	-0.19	51.38	8.51		
Other	32.16	-0.05	30.67	0.88	92.47	-7.22	55.24	0.16	16.30	-2.16	10.00	-3.76		
USD	6.11	-0.67	31.90	-4.29	48.24	-11.90	36.79	0.94	50.44	-4.58	6.23	1.37	1.57	-0.25

Time series of liquidity and execution quality

Thus far, an aggregated snapshot of cost over an 18-month period has been provided. But has a material change in costs been noted over the life of the dataset? In this section, we review the liquidity and execution quality landscapes using monthly time series for the following currency/asset class combinations: USD/high grade, USD/high yield, EUR/high grade and EUR/high yield.

To measure the liquidity landscape, we began by looking at whether equally-weighted average spread size and liquidity score changed with time. From there, the associated quartiles were examined to understand the distribution of spread sizes.

The first step toward exploring execution quality entailed looking at the time series of the distribution (first quartile, median and third quartile) of the Last Mid Slippage. The second step involved examining the time series of the percentage breakdowns between transactions executed within the prevailing quoted spread and those executed outside of it.

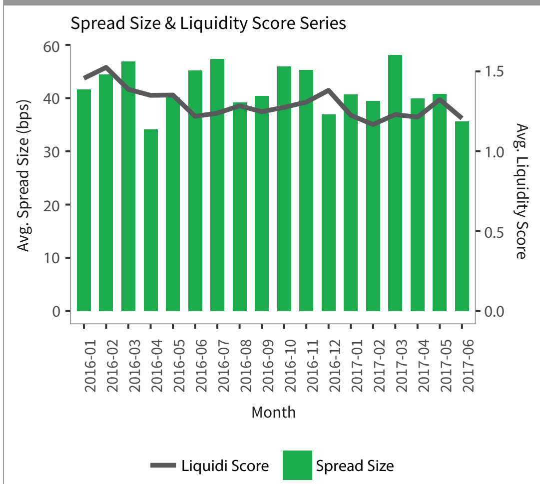
Based on this analysis, across the previously specified currency/asset class combinations, the following was identified:

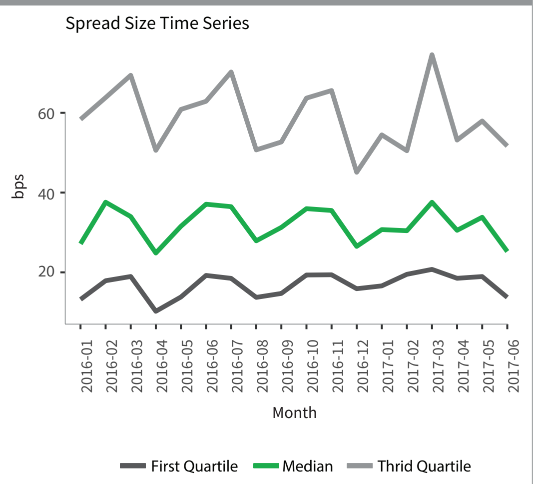
1. Tangible movement in the marketplace toward stronger liquidity (tighter spread); and
2. Better execution quality (smaller variances in transaction costs and a larger percent of transactions inside the prevailing spread).

USD/High Grade Bonds

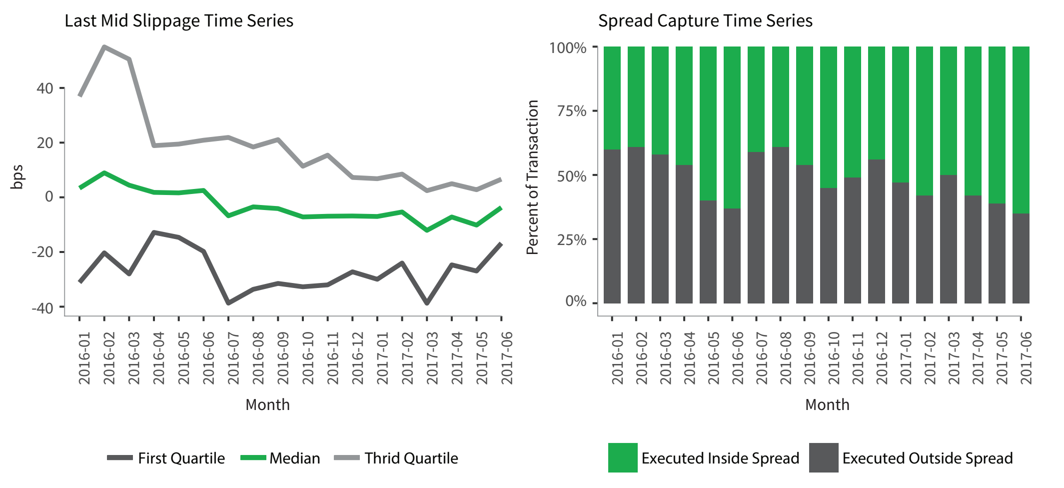
For USD/high grade bonds, quoted spread size over time appeared to be stable from both an equally weighted average and a median perspective. The average liquidity score improved from 1.46 on January 2016 to about 1.2 on June 2017.

USD High Grade Bonds





USD High Grade Bonds

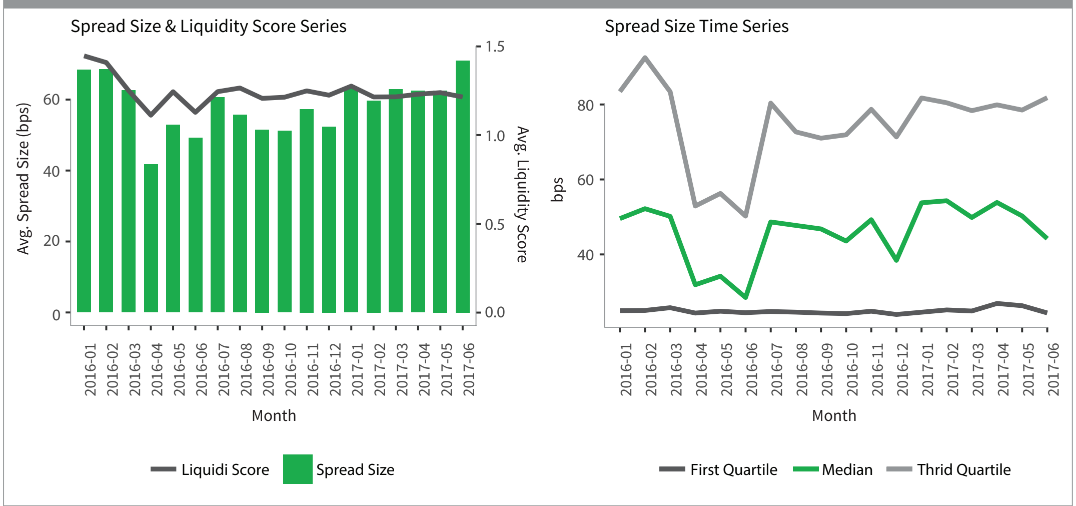


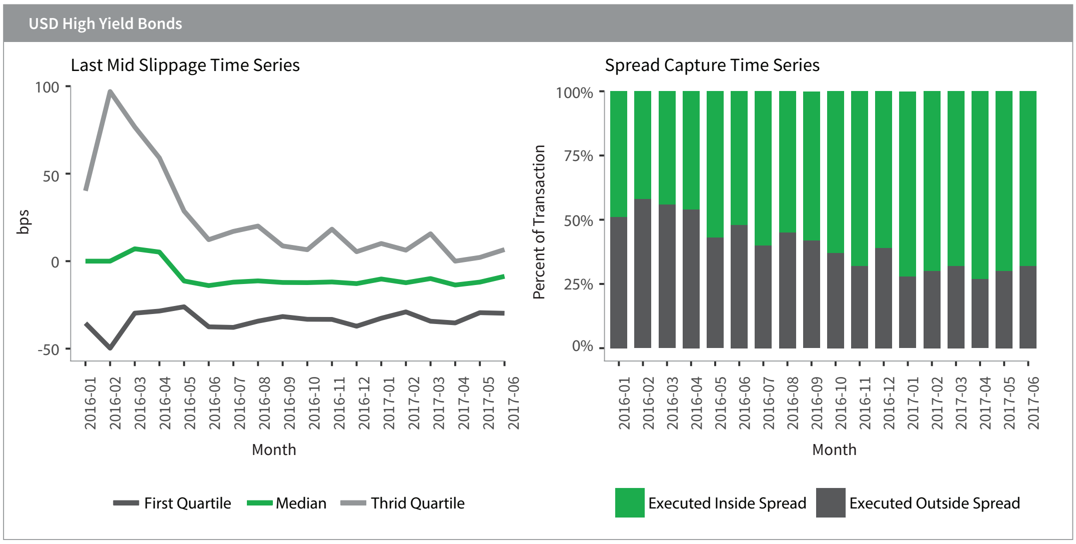
From an execution quality perspective, we can see the band from the 1st to 3rd quartile of the Last Mid Slippage materially contracted, indicating less variation in transaction costs. We also observed the percentage of transactions executed inside the prevailing spread improved from 44% to 60% across the board. Both metrics indicated improved execution quality.

USD/High Yield

For USD/high yield bonds, quoted spread size shrank significantly in Q2 2016, only to gradually climb back to its previous level of 70 bps. The average liquidity score experienced a similar but milder swing during this period. One of the most interesting findings was that the 1st quartile of spread size appears to be very stable, hovering around 15 bps over time.

USD High Yield Bonds

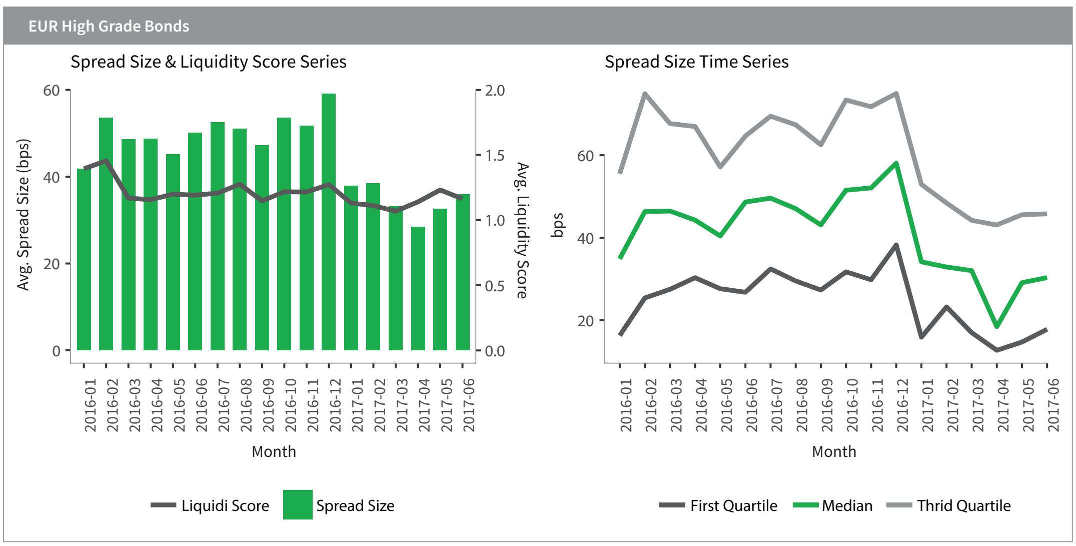


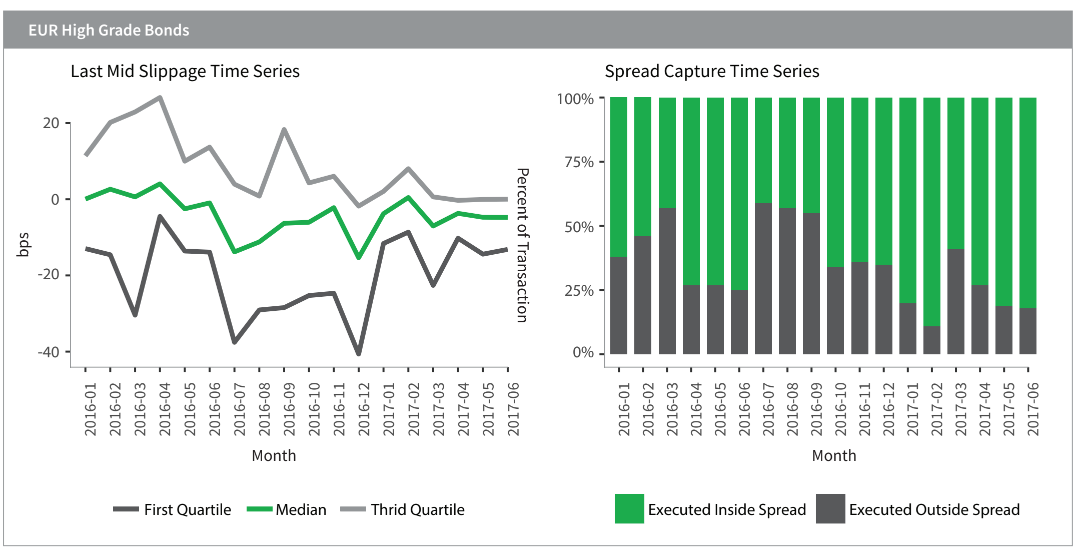


The deviation of Last Mid Slippage for USD/high yield bonds saw a drastic narrowing around Q2 2016; however, the associated median seemed to deteriorate from a level of 0 to a level of -10 bps, where it has remained. The percentage of transactions executed inside the prevailing spread was also observed and was shown to have improved from 50% to 70%.

EUR/High Grade

For EUR/high grade bonds, quoted spread size started to narrow significantly at the beginning of 2017 from 50 bps to a level of 35 bps. The average liquidity score improved from 1.40 in January 2016 to approximately 1.16 in June 2017.

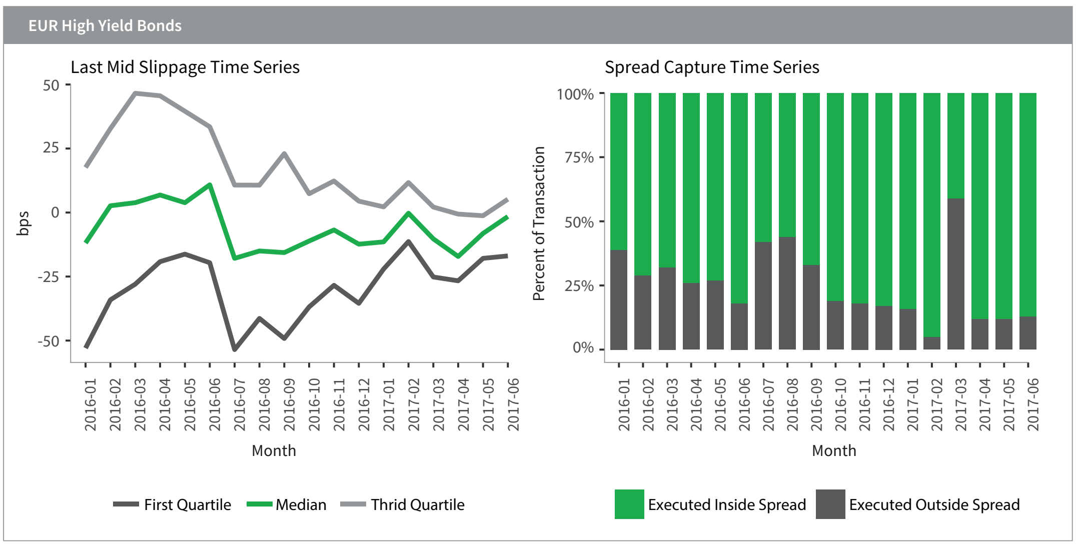




Along with the spread contraction observed earlier for the USD groups, Last Mid Slippage for EUR/high grade bonds also saw a compression between the bands at the start of 2017.
The percentage of transactions executed inside the prevailing spread was also observed and showed an improvement from 61% to 82%, albeit with much more volatility month-by-month compared to their US counterpart.

EUR/High Yield

Similar to EUR/high grade bonds, EUR/high yield bonds saw quoted spread size begin to compress significantly at the start of 2017, from a level of 90 bps to a level of 65 bps. The average liquidity score improved slightly from 1.54 in January 2016 to approximately 1.43 in June 2017.



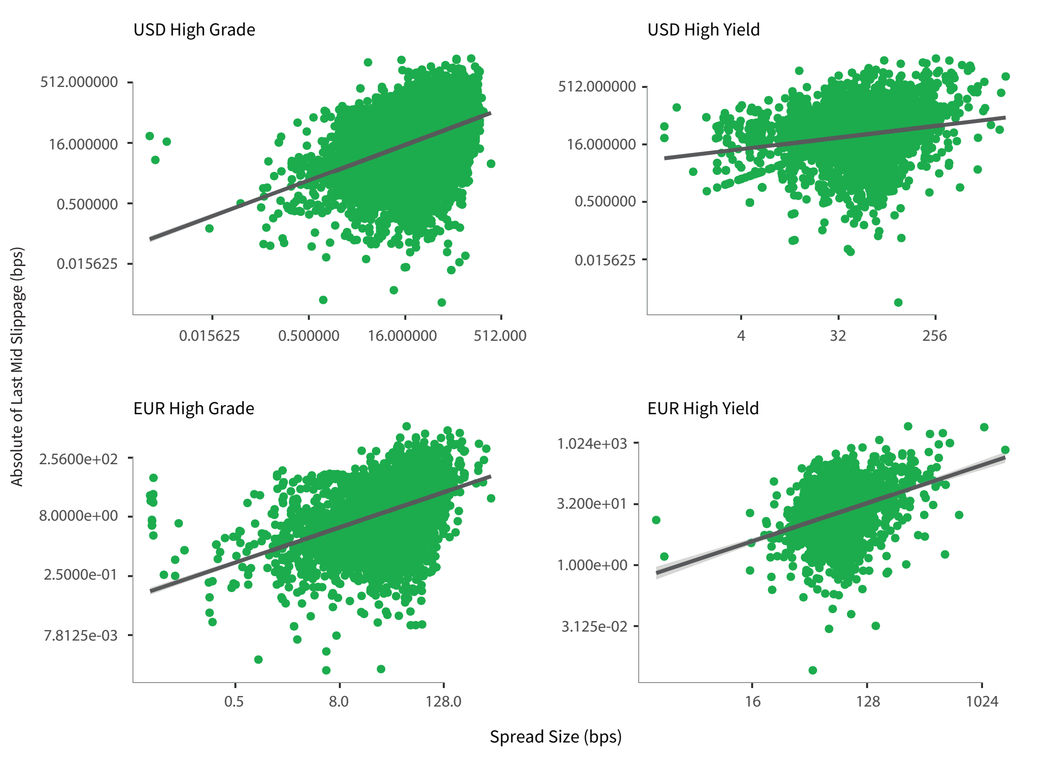
Last Mid Slippage for EUR high yield bonds witnessed a material compression of the variation in the bands across the eighteen months of data studied. Also observed: The percentage of transactions executed inside the prevailing spread improved from 61% to 88%, with the exception of a large swing back in March 2017.

The real relationship between transaction cost and liquidity

Fixed income traders often use spread size as an indication of liquidity in an instrument. How definitive is that relationship? In this section, we study the statistical relationship between execution quality (approximated by absolute value of Last Mid Slippage) and the liquidity landscape (approximated by spread size and liquidity score).

In our examination, findings showed a positive relationship amongst the same four currency and asset class combinations. Below are scatter plots of these two variables for each category. The positive relationship can be seen universally by the positive slope of the linear best fit line (black, upward sloping line) displayed in each of the graphs.

Scatter Plot of Cost Dispersion vs. Spread Size



Amongst them, EUR/high yield bonds had the highest Pearson correlation coefficient between absolute cost and spread size (47.59%), indicating that the prevailing quoted spread size is a major cost driver.

Table 4: Correlation between liquidity and transaction costs

	Correlation of Absolute Value of Last Mid Slippage vs. Spread Size	Correlation Absolute Value of Last Mid Slippage vs. Liquidity Score
USD High Grade	29.49%	17.27%
USD High Yield	31.81%	17.06%
EUR High Grade	31.15%	22.89%
EUR High Yield	47.59%	24.10%

Deal size effect on transaction cost

Conventionally, fixed income practitioners believe that deal size has a certain impact on expected transaction costs. In the following section, we test this hypothesis.
To do this, deal size was classified into the following five US Dollar categories:

- 0.5 Million to 2 Million
- 2 Million to 5 Million
- 5 Million to 10 Million
- 10 Million to 25 Million
- 25 Million+

When these buckets were considered in conjunction with asset class, the findings showed very different distributions. For example, a substantial portion of sovereign and US Treasuries transactions were in the $25M+ group (19.91% and 17% respectively), while a mere 1.04% of high yield transaction aligned with this category.

Table 5: Percent of transaction counts by asset class

	0.5M-2M	2M-5M	5M-10M	10M_25M	25M+	Grand Total
High Grade	43.64%	25.00%	15.53%	11.86%	3.97%	100.00%
High Yield	51.97%	31.50%	11.64%	3.84%	1.04%	100.00%
Other	43.84%	26.34%	14.19%	9.32%	6.31%	100.00%
Sovereign	16.32%	16.12%	21.13%	26.51%	19.91%	100.00%
Structured	67.95%	13.52%	8.47%	6.31%	3.75%	100.00%
UST	29.54%	21.77%	15.37	16.32%	17.00%	100.00%
Agency	53.28%	16.44%	11.21%	6.90%	12.17%	100.00%
Grand Total	37.08%	19.88%	15.91%	15.73%	11.40%	100.00%

Based on the observations above, a valuable way to examine the relationship between costs by deal size is to look at each asset class. In this exploration, we calculated both the Pearson correlation coefficient (PCC) and Spearman's ranking correlation coefficient (Rho). Both statistics were considered as the distribution of deal size and cost deviations are non-normal, which translates in limitations in the application of the Pearson method. Spearman's ranking correlation calculation allows us to measure the potential nonparametric monotonic relationship in this data. (i.e. Do relatively larger trades, regardless of exactly how large, tend to have higher or lower cost deviations than smaller one?)

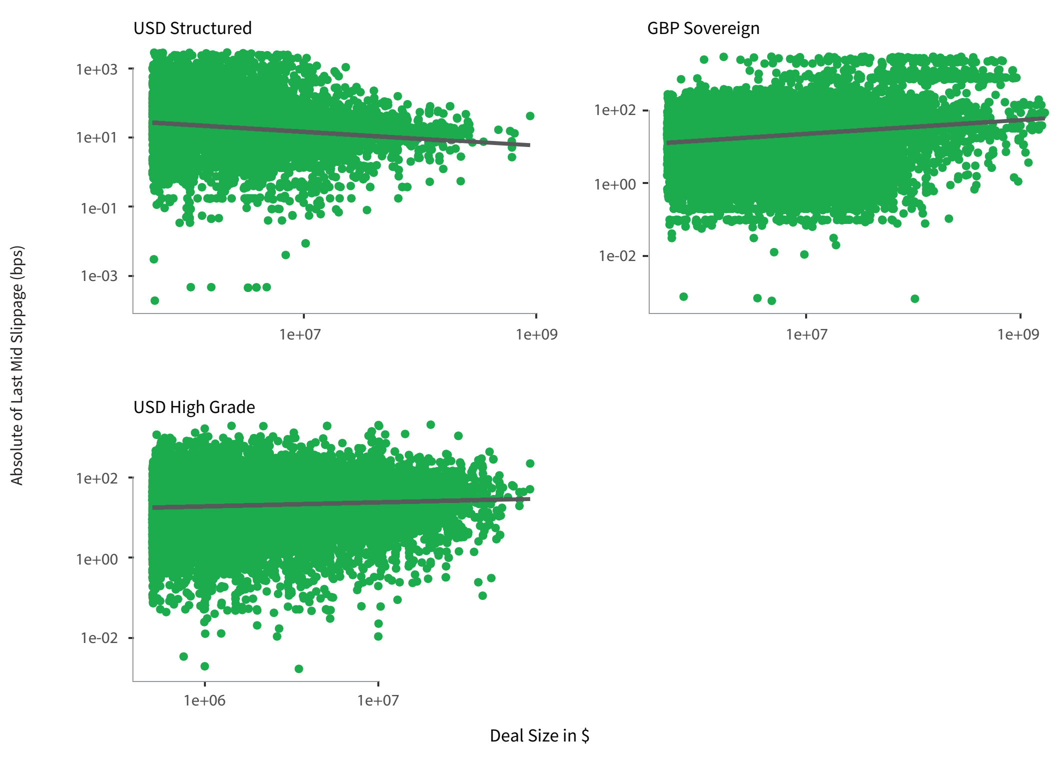
By going through each combination as summarized in the table above, we find mixed results. The majority of the combinations have very weak, if not conflicting PCC and Rho statistics, indicating a lack of relationship between deal size and cost deviation. A few outstanding exceptions with meaningful underlying observations are:

- USD/Structured (38,703 observations, negatively correlated),
- GBP/Sovereign (67,737 observations, positively correlated), and
- USD/High Grade (30,733 observations, positively correlated).

	USD		EUR		GBP		Rest	
	PCC	Rho	PCC	Rho	PCC	Rho	PCC	Rho
High Grade	3.45%	6.74%	1.17%	1.37%	12.55%	3.74%	-1.13%	-5.19%
High Yield	0.12%	-0.11%	-0.34%	3.01%	0.88%	6.24%	14.16%	35.11%
Sovereign	2.14%	1.26%	0.18%	-2.48%	21.51%	12.83%	-0.90%	2.44%
Structured	-2.85%	-19.69%	-10.15%	-1527%	-4.37	3.01%	-71.08%	-92.76%
UST	-1.69%	-1.56%						
Agency	-1.24%	-4.20%	0.22%	-2.66%	-5.29%	3.42%	7.72%	0.51%
Other Classes	-0.91%	2.49%	0.04%	-3.00%	6.18%	-3.12%	12.46%	-1.09%

The scatter plot for these three combinations have been drawn to see whether the correlation was affected by any outliers. In the graphs below, the slope of the best fit linear line indicates that cost dispersion tends to decrease for USD/structured products (i.e. the larger the size, the smaller cost dispersion), and to increase for GBP/sovereign and USD/high grade.

Scatter Plot of Cost Dispersion vs. Deal Size



Conclusion

The global regulatory overhaul that has taken place since the financial crisis has changed the landscape of the fixed income markets significantly. By examining liquidity and transaction cost dispersion over time, this study was able to:

- Identify material market evolution towards more liquidity and better execution quality.
- Show that cost dispersion is strongly related to the prevailing quoted spread amongst US and EU corporate bond markets for the period under analysis.
- Whilst a universal conclusion cannot be drawn, the data does indicate an opportunity to challenge the conventional wisdom that dictates a relationship exists between deal size and cost dispersion in general.

By Patrick Fang, CFA, CAIA, Trading Analytics, IHS Markit

Appendix

Data and cost measurement methodology

The market data source for IHS Markit's fixed income TCA solution is our fixed income pricing data. This dataset provides robust coverage across government, sovereign, agency, corporate and municipal bonds; structured finance products; interest rate and credit default swaps; loans; etc. This pricing data is fueled with observable prices sourced directly from:

- Leading industry practitioners
- Data captured by our real-time parsing technology
- From sources such as MSRB and FINRA

This dataset is also quality-controlled by multiple rigorous cleaning algorithms, and is used by practitioners for various regulations, including UCITS, US '40 Act fund management, MiFID, FAS157 / TOPIC 820, IASB, Solvency II and Basel.

This study focuses on six core asset classes:

- Corporate bonds
- Sovereign bonds
- Municipal bonds
- Government bonds
- Agency bonds
- Securitized products

The pricing data used in this study was updated using three types of frequencies, depending on the liquidity of the asset class.

The most liquid corporate bonds (about 35,000 instruments) were updated real-time; the remaining indicated bonds were updated hourly.

Securitized products and municipal bonds were updated in two end-of-day batches at 15:00 and 16:00 US Eastern Time.

Using the transaction timestamps reported by our clients, we were able to identify prevailing market conditions at the time of each transaction. As such, we were able to contextualize their associated liquidity profile and transaction costs.

This study primarily uses the following metrics:

– Last Mid Slippage: The slippage of the client price versus the mid of the last evaluated quote prior to the execution timestamp (subject to different pricing update frequencies). This measure is converted to basis points of the referenced mid and can be viewed as the implementation shortfall of the transaction.

$$LastMidSlippage\ (bps) = Side\ Adjustor \times \frac{LastMidQuote - Executedprice}{LastMidQuote} \times 10000$$

– Spread Size: The size of the prevailing bid-ask spread of the last evaluated price prior to the reported timestamp, normalized to basis points of the last mid. This metric is used primarily as the liquidity profile each bond in this study.

$$SpreadSize\ (bps) = \frac{LastAsk - LastBid}{LastMidQuote} \times 10000$$

– Liquidity Score: A proprietary measure developed by the IHS Markit Bonds Pricing Team, to gauge the liquidity profile for each instrument each day based on market depth, bid-offer spreads and market activity. Possible values are integers from 1 to 5, with 1 indicating liquid and 5 illiquid.

Sample selection, and descriptive statistics

Exclusions

- Trades valued at less than $500,000, which we deem as "retail" size cutoff in a global context
- Convertible bonds whose cost measurement would be impacted by the moneyness of imbedded options
- All transactions with slippage beyond +/-3000 bps versus the last mid
  (Such slippage may be due to idiosyncratic or name-specific events and could potentially distort results.)

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