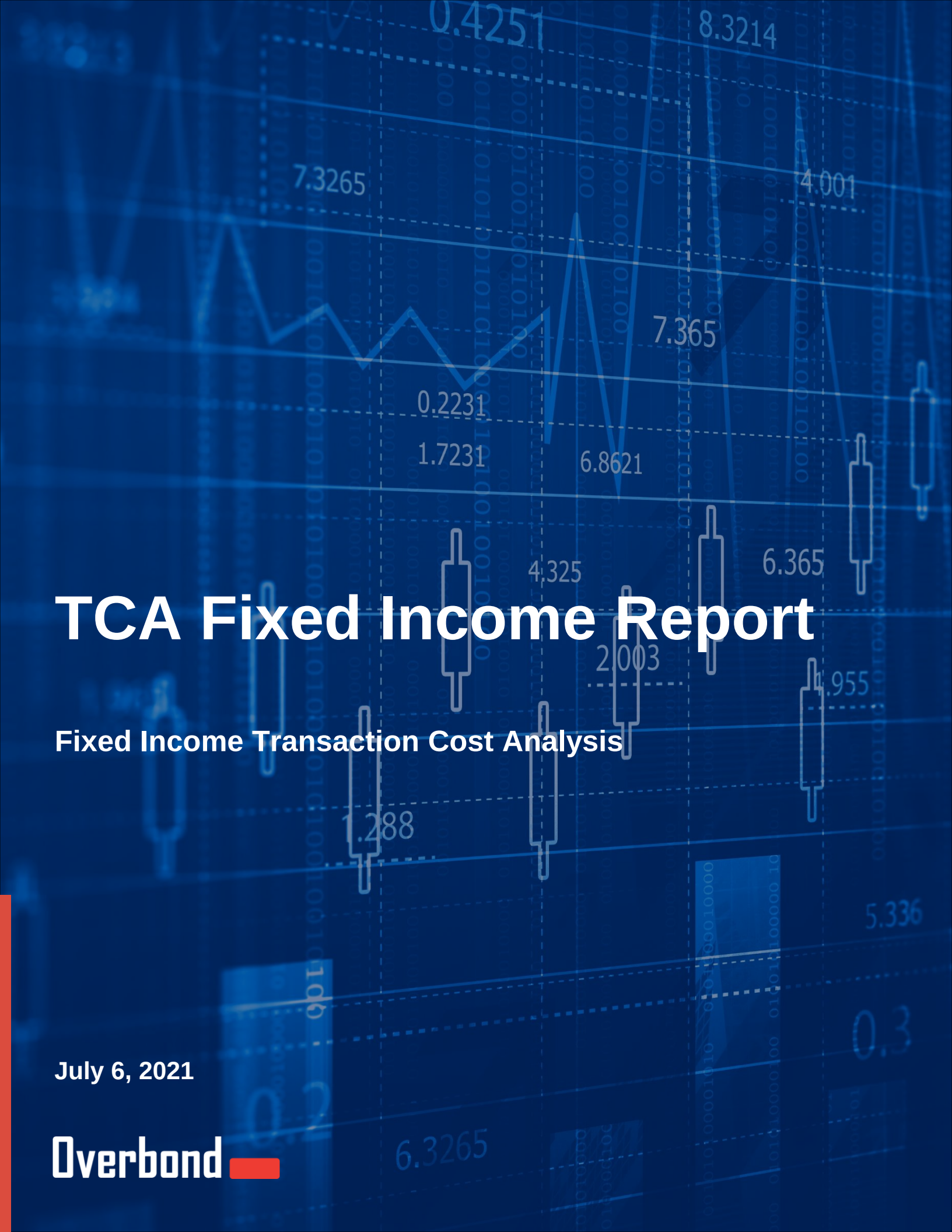


TCA Fixed Income Report

Fixed Income Transaction Cost Analysis

July 6, 2021

Overbond

OVERVIEW

The overall aim is the measurement of transaction costs on a sample set of actual Q1/21 cash transactions.

While the absolute goal in trading corporate bonds from a transaction cost perspective is to buy as close to the bid side of the market as possible, and to sell at as close to the ask side as possible in order to reduce costs of transaction.

An appropriate yardstick would be to consider a mid-price quote (half-way between the bid and the ask), that is for contrasting trades execution prices against Overbond bond mid-price levels.

ASSUMPTIONS

From a total of 3,740 trades over the first quarter of 2021, a sample of 125 corporate cash bond transactions has been selected (7 purchases and 118 sales).

Mid-Prices are defined as the arithmetic average between Overbond COBI Live bid and ask prices as close as possible to the time-stamped transaction times.

This document is based on cost analysis. The main variable of concern is costs, thus, any negative/positive figure in the report leads to decrease/increase in costs.

Reported Credit Ratings are Issuer Based.

Transaction Costs were also aggregated by Overbond Liquidity Tier scoring metric (i.e., 1-3, with 1 having highest market liquidity).

The total dataset provided includes 3,740 trades for 733 unique ISINs.

Total traded size equals to 158,973 USD Million.

OVERVIEW

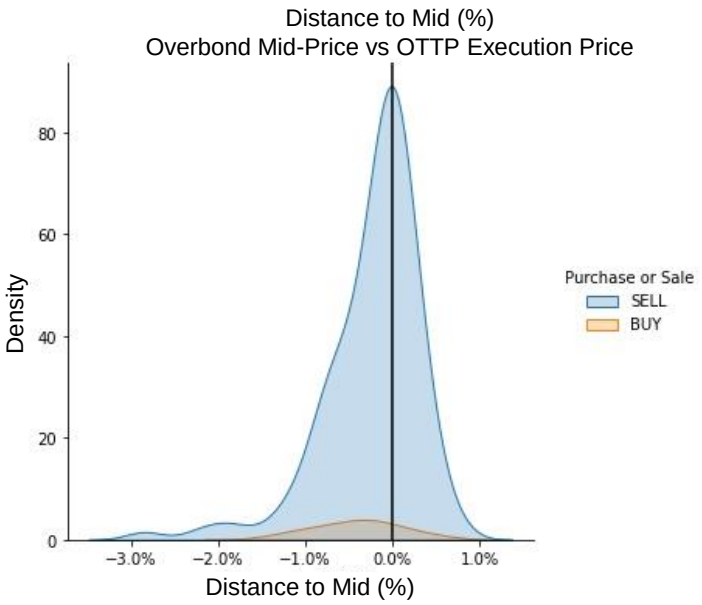
The graph { Distance to Mid (%) } at the bottom of the page compares Overbond mid-price levels vs execution prices. Hence, it shows the univariate distribution of distance to mid in percentage of executed prices against the density distribution. As this is an analysis on costs, negative values mean a reduction in costs, whereas positive values mean an increase in costs. For example, a Purchase transaction where:

Execution price : 125$
COBI Live mid-price : 120$
Distance to mid = -5$ (120-125) *i.e "Mid-Price – Execution Price"*
Distance to mid in % = -5$ / 125$ = -4% *i.e "Distance to Mid / Execution price"*

This means that the trade has been executed as a purchase above the mid-price which would be commonly considered as a "poor" execution.
Hence, executing at COBI Live mid-price levels would have reduced the transaction cost by 5$, thus reducing costs.

Overall, trades have been executed poorly at an average distance to mid of 0.27$. It has performed well 38% of the time based on trade count and the opposite is true for 62% of the time. As illustrated in the table at the bottom right of the page, half of the trades have been unfavorably executed at a minimum of 12¢ distance from the mid-price. This represents 0.11% of the executed price. Meaning that half of the transactions have inappropriately executed at a minimum distance of 0.11% of their value from their respective COBI Live mid-price level.

Significant cost savings could have been achieved on several transactions as per the negatively skewed distribution of the distance to mid values as well as the magnitude of the distance for specific outliers in this distribution. This is the case for both Sell and Buy orders.



	Distance to Mid ($)	Distance to Mid (% of Executed Price)
mean	$-0.27	-0.25%
std	$0.60	0.55%
min	$-2.66	-2.84%
25%	$-0.52	-0.53%
50%	$-0.12	-0.11%
75%	$0.08	0.08%
max	$0.83	0.74%

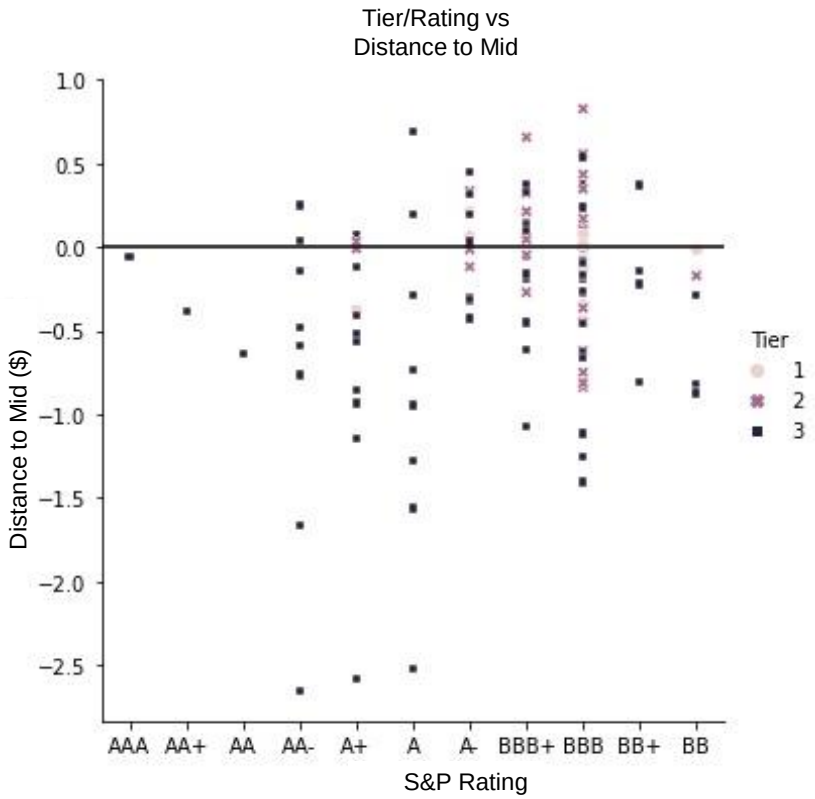
TRANSACTION COST ANALYSIS

The graph below provides a visual output for visualizing statistical relationships between Credit ratings (AAA to BB) , Tiers (1 to 3) and Distance to Mid in $ terms.

- The Tier value is indicative of the liquidity profile of the security being traded, at the moment of the trade.
- S&P Credit ratings are Issuer level ratings.
- Distance to Mid is expressed in $ terms for simplicity.

Each dot represents one trade. As well, each dot has a color to it representing its Tier.

Above the horizontal black line lay all trades that have been well executed. Meaning that execution prices were above COBI Live mid-level prices when selling and below when buying. To the contrary, all dots below the black line, represent the opposite situation where trades were poorly executed.



Overall, trades execution has been relatively poor across all tiers and credit ratings as demonstrated by the visual above, with a special focus on higher ratings and greater liquidity tiers.

Translating Distance to Mid into actual transaction costs based on trade size and grouped by credit ratings and tier, you would find the following table.

As shown, executing away from Cobi Live mid-price levels has induced adverse cost effects amounting to a total of 2,871,819$ which represents an average of 22,975 $ per transaction with the greatest impact relating to BBB rated bonds.

RESULTS TABULATION – BY CREDIT RATING

Credit Rating	Tier	Recommendation	Count	Average Bid/Ask Spread	Average Distance to Mid ($)	Total Cost Impact	Average Cost impact
AAA	3	Not Recommended	1	0.37	-0.06	($1,980)	($1,980)
SubTotal			**1**	**0.37**	**-0.06**	**($1,980)**	**($1,980)**
AA+	3	Not Recommended	1	0.59	-0.38	($9,260)	($9,260)
SubTotal			**1**	**0.59**	**-0.38**	**($9,260)**	**($9,260)**
AA	3	Not Recommended	2	0.58	-0.64	($127,270)	($63,635)
SubTotal			**2**	**0.58**	**-0.64**	**($127,270)**	**($63,635)**
AA-	3	Not Recommended	8	0.56	-0.75	($553,178)	($69,147)
SubTotal			**8**	**0.56**	**-0.75**	**($553,178)**	**($69,147)**
A+	1	Highly	1	0.26	-0.38	($18,676)	($18,676)
	2	Highly	1	0.27	0.03	$309	$309
		Not Recommended	1	0.26	-0.01	($98)	($98)
	3	Not Recommended	10	0.63	-0.71	($671,998)	($67,200)
SubTotal			**13**	**0.55**	**-0.57**	**($690,464)**	**($53,113)**
A	3	Not Recommended	8	0.71	-0.81	($497,190)	($62,149)
SubTotal			**8**	**0.71**	**-0.81**	**($497,190)**	**($62,149)**
A-	1	Highly	2	0.15	0.14	$7,525	$3,762
	2	Not Recommended	3	0.52	0.07	$5,017	$1,672
	3	Slightly	1	0.25	0.31	$2,763	$2,763
		Not Recommended	10	0.71	-0.05	$20,167	$2,017
SubTotal			**16**	**0.58**	**0.02**	**$35,472**	**$2,217**
BBB+	2	Highly	3	0.15	0.10	$10,223	$3,408
		Slightly	1	0.16	0.32	$8,976	$8,976
		Not Recommended	4	0.18	0.14	$24,505	$6,126
	3	Slightly	2	0.76	0.25	$27,055	$13,528
		Not Recommended	10	0.67	-0.20	($154,906)	($15,491)
SubTotal			**20**	**0.48**	**-0.02**	**($84,148)**	**($4,207)**
BBB	1	Highly	7	0.15	-0.14	($26,340)	($3,763)
	2	Highly	1	0.34	0.04	$1,506	$1,506
		Slightly	2	0.66	-0.14	($50,792)	($25,396)
		Not Recommended	14	0.43	-0.06	($257,845)	($18,417)
	3	Slightly	8	0.38	-0.07	($34,734)	($4,342)
		Not Recommended	15	0.81	-0.39	($424,497)	($28,300)
SubTotal			**47**	**0.51**	**-0.18**	**($792,702)**	**($16,866)**
BB+	3	Not Recommended	4	0.54	-0.20	($12,982)	($3,246)
SubTotal			**4**	**0.54**	**-0.20**	**($12,982)**	**($3,246)**
BB	1	Highly	1	0.09	-0.02	($309)	($309)
	2	Not Recommended	1	0.06	-0.17	($1,801)	($1,801)
	3	Slightly	1	1.00	-0.88	($24,306)	($24,306)
		Not Recommended	2	0.26	-0.55	($111,702)	($55,851)
SubTotal			**5**	**0.33**	**-0.43**	**($138,118)**	**($27,624)**
Grand Total			**125**	**0.53**	**-0.27**	**($2,871,819)**	**($22,975)**

Translating Distance to Mid into actual transaction costs based on trade size and grouped by Tier and recommendation levels, you would find the following tables.

RESULTS TABULATION – BY OVERBOND LIQUIDITY TIER

Tier	Recommendation	Count	Average Bid/Ask Spread	Average Distance to Mid ($)	Total Cost Impact	Average Cost impact
1	Highly	11	0.16	-0.10	($37,800)	($3,436)
	SubTotal	**11**	**0.16**	**-0.10**	**($37,800)**	**($3,436)**
2	Highly	5	0.21	0.08	$12,037	$2,407
	Slithly	3	0.50	0.02	($41,815)	($13,938)
	Not recommended	23	0.38	-0.01	($230,222)	($10,009)
	SubTotal	**31**	**0.36**	**0.00**	**($260,001)**	**($8,387)**
3	Slithly	12	0.48	-0.05	($29,220)	($2,435)
	Not recommended	71	0.66	-0.44	($2,544,796)	($35,842)
	SubTotal	**83**	**0.64**	**-0.39**	**($2,574,017)**	**($31,012)**
Grand Total		**125**	**0.53**	**-0.27**	**($2,871,819)**	**($22,974)**

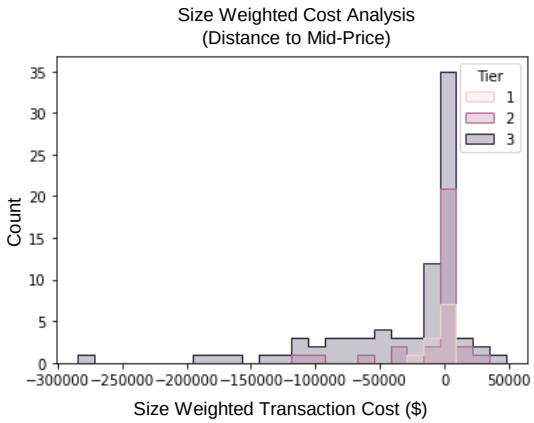
From a cost analysis standpoint, trading away from COBI Live mid-price levels has resulted in important costs increase for Tier 3 instruments with an average of 31,012$.

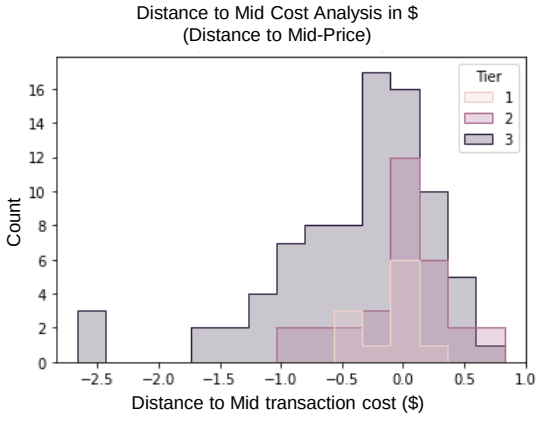
RESULTS TABULATION – BY DEALER

Dealer or Platform	Average Bid Ask	Average Bid to Mid	Total Transaction Costs	Average Trade Size Weighted Bid to Mid
Bloomberg	0.342	0.0260	287,181	7,467
MarketAccess	0.341	0.0255	315,900	8,055
BofA	0.335	0.0255	258,463	6,591
CIBC	0.335	0.0250	301,541	7,539
CITI	0.336	0.0263	235,489	6,185
GS	0.343	0.0260	295,797	7,691
JPM	0.342	0.0255	313,028	7,982
BMO	0.334	0.0253	272,822	6,889
TD	0.340	0.0275	318,771	8,766
Wells Fargo	0.332	0.0272	272,822	7,421
Aggregate	0.337	0.0270	2,871,819	7,459
Electronic Trading	0.339	0.0255	746,672	7,413
Dealer OTC	0.336	0.0250	2,125,146	7,454

TRANSACTION COST ANALYSIS VISUALIZATION

The illustrations below present a visualization for size weighted transaction costs as well as simple transaction costs at a bond price level, that is grouped by their specific Tier.

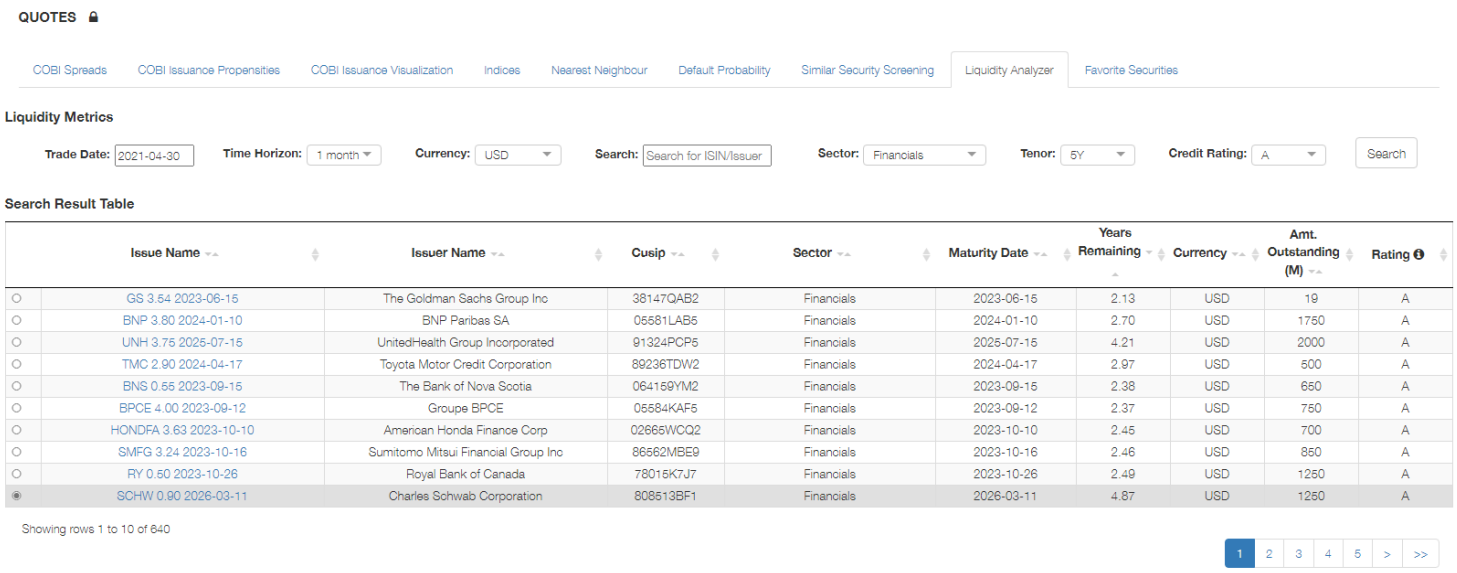




LIQUIDITY ANALYZER TOOL

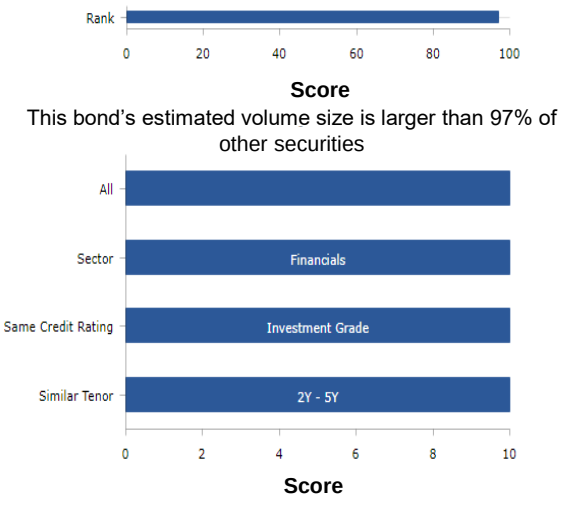
The liquidity Metrics solution provides an overview of the liquidity profile for the bonds universe.

It provides a way to scroll through publicly traded bonds by filtering for currency, sector, tenor and credit rating which provides a great screener and visualization tool for fixed income securities.

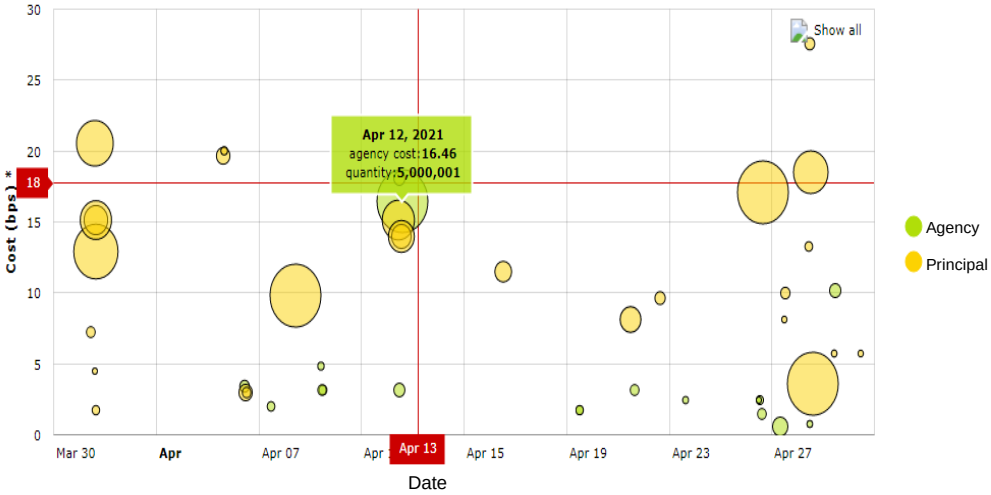


Once a bond is selected, you get a full picture of liquidity metrics for the respective issuance going from historical liquidity rank/premium as well as liquidity scores for the same credit rating, sector, tenor and overall industry group.

Liquidity Rank



Liquidity Premium (2021-03-30 – 2021-04-30)

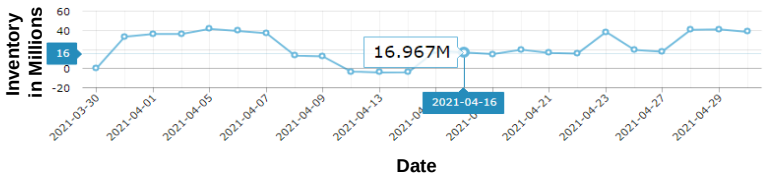


*One-way trip trade cost by measuring the spread between buy/sell price and inter-dealer price divided by inter-dealer price

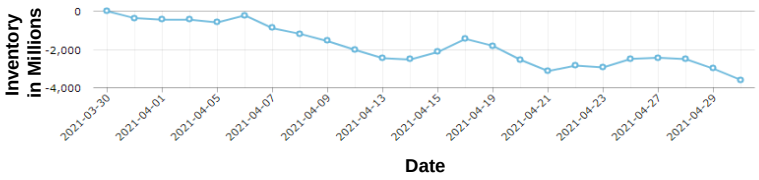
LIQUIDITY ANALYZER TOOL

Allowing as well for the visualization of historical Market Depth and Depth Comparison. Which provides an overview of the current and past market conditions. That is regarding Dealer Inventory and volume metrics as well as the turnover rate of financial investment grade instruments.

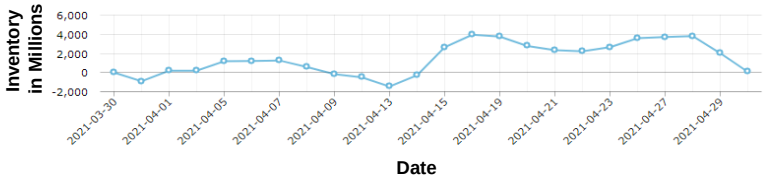
Consolidated Dealer Inventory Index – 808513BF1 (2021-03-30 – 2021-04-30)



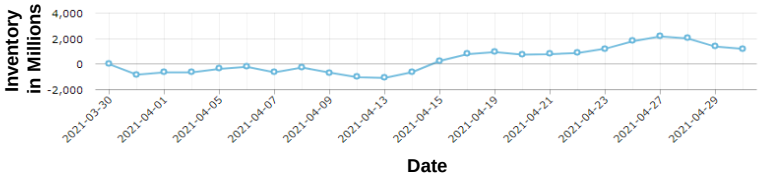
Consolidated Dealer Inventory Index – Financials (2021-03-30 – 2021-04-30)



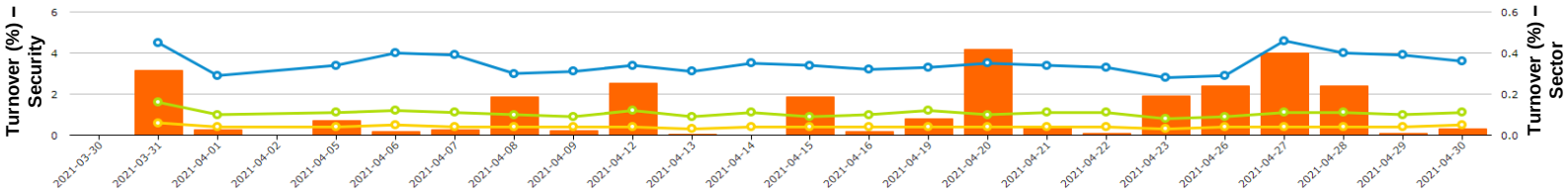
Consolidated Dealer Inventory Index – Investment Grade (2021-03-30 – 2021-04-30)



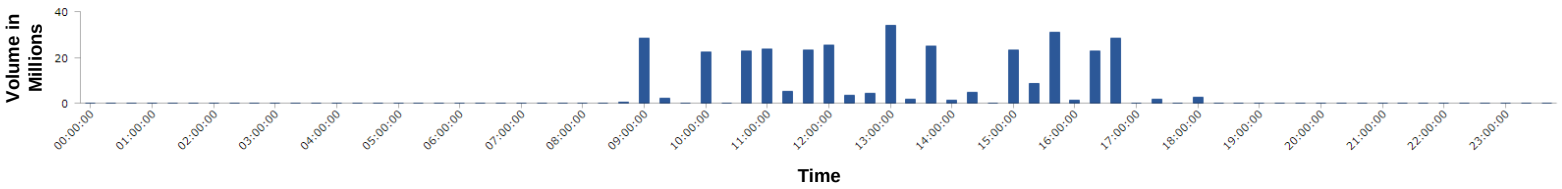
Consolidated Dealer Inventory Index – 2Y – 5Y Tenor (2021-03-30 – 2021-04-30)



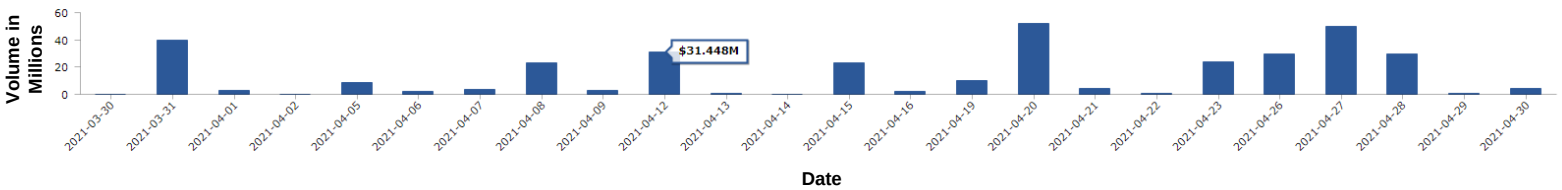
Turnover – 808513BF1 Financials Investment Grade (2021-03-30 – 2021-04-30)



Volume by Time (2021-03-30 – 2021-04-30)



Daily Trade Volume (2021-03-30 – 2021-04-30)



Trade Count (2021-03-30 – 2021-04-30)

