

# Municipal Market Analytics

## Municipal Bond Portfolio Management Training Module

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# What does a portfolio manager do??



[Clip Art Link](#)

## Topics:

- Organization/Clients
- Investment Vehicles
- Portfolio Process/Pillars of Portfolio Management

# Yield To Maturity

- Rate of return received if you hold the bond to maturity and reinvest all coupon income at the same (initial) yield.

# Yield Calculation

## -Denton, TX ISD Bond Example

249002LQ Muni		Settings ▾	Yield and Spread Analysis	
117.675/117.853	2.949/2.930	BVAL @ 7/12/	Notes	95 Buy 90 Sell
1) Yield & Spread		2) Yields		
DENTON TX INDEP SCH DIST		CUSIP 249002LQ7		
Settle	08/10/23	Ticker	DNNSCD	Cpn 5.000 Maturity 08/15/2033 Dated 07/15/2023 State TX
Price	117.764	To Maturity	To Worst	
Concession	0.000	08/15/2033	08/15/2033 @	100.00
Price less Concession	117.764	Yield	% Tsy	Yield % Tsy
Yield (no Concession)		2.939	77.8	2.939 77.8
Yield with Concession		2.939	77.8	2.939 77.8
After Tax Yield ( Inc 40.80 CG 23.80 OID 0.00 )		2.939	77.8	2.939 77.8
Taxable Equivalent Yield @ 40.80		4.965	131.4	4.965 131.4
Current Yield		4.246		
PV ▾ 0.01		0.09498		0.09498
Modified Duration		7.902		7.902
Issue prc = 117.472(2.970). Bond purchased at a premium.				
Invoice	Income	To 08/15/2033	Description	
Face	1,000 M	Principal	1,000,000.00	Type GENERAL OBLIG...
Principal	1,177,640.00	Cpn Payment	500,694.44	Prc/Yld @ Iss 117.472/2.970
Concession	0.00	Reinv @ 2.94 %	76,594.01	Lead PIPER SANDLER...
Prin less Conc	1,177,640.00	Total Income	1,577,288.46	Issue Size 949.1MM
Accrued (0 Days)	0.00			Maturity Size 19.1MM
Total (USD)	1,177,640.00			Amt Out 19.1MM

# Price/Yield Relationship

-Denton, TX ISD Bond Example



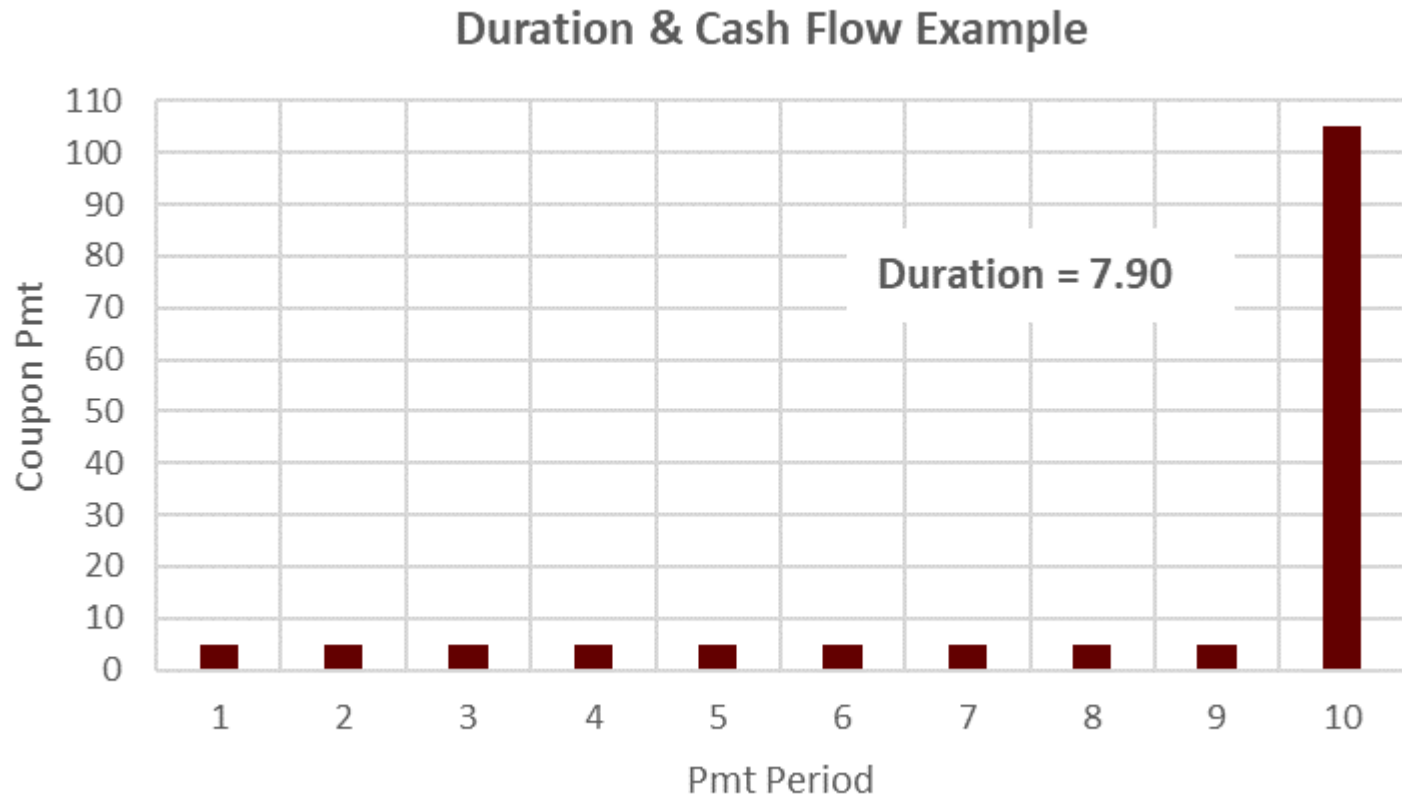
# Duration

## -Bond's sensitivity to changes in interest rates

Duration – Is the weighted average time to receive all cash flows from a bond – coupon payments and principal payment.

- It turns out that duration is a good measure of the sensitivity of a bond's price to changes in interest rates.
- If a bond has a duration of 5 years and interest rates decrease by 1%, the bond's price will increase by approximately 5%
- If a bond has a duration of 5 years and interest rates increase by 1%, the bond's price will decrease by approximately 5%.
- All other things being equal, the longer a bond's duration, the more the price will change for a given change in interest rates.

# Duration/Cash Flow Example





# Fixed Income Portfolio Management

- Construct a set of fixed income instruments or securities (“bond portfolio”) that seeks to meet the investment objectives of a client – typically, a steady stream of income and capital preservation – within a set of risk constraints.

# Organizational Climate

# Management Style: “Star System”



# Management Style: “Traffic Cop”



# Active – Passive Continuum

“Go Anywhere” ←— Constrained —→ Passive/Index

# Total Return vs. Index (as of 5/23)

Years

	1	3	5	10
Portfolio	0.10	-0.44	2.00	2.78
Bloomberg Muni Index	0.49	-0.64	1.65	2.28
Difference	-0.39	0.20	0.35	0.50

## Returns and Risk, 5 Year Period (3/23)

	<b>Portfolio</b>	<b>Bloomberg Aggregate</b>
<b>Total Return (ann)</b>	1.41%	0.91%
<b>R Squared</b>	96.0	—
<b>Information Ratio</b>	0.5	—
<b>Std. Deviation</b>	5.25	5.46

# Types of Clients

- High Net Worth/Family Office
- P&C Insurance
- Banks
- Other Institutions
- Non-taxable Investors



# Municipal Demand Components

**2018 - 2023 Change in Par Held By Demand Component**

	<b>SMA</b>	<b>Mutual Fund</b>	<b>Banks</b>	<b>ETFs</b>	<b>Households</b>	<b>P&amp;C's</b>	<b>Life Ins</b>	<b>MMF</b>	<b>Closed End</b>
2018 (\$B)	445	694	329	36	1,884	291	190	147	88
2023 (\$B)	926	770	364	106	1,668	242	195	114	84
Chg (\$B)	481	76	35	70	(216)	(49)	5	(33)	(4)
Chg (%)	108%	11%	11%	194%	-11%	-17%	3%	-22%	-5%

# High Net Worth

- After tax income
- Diversification
- Capital Preservation

# P&C Insurance Companies

- Income, Diversification, Capital Preservation +
- Book Yield
- Asset/Liability Management
- Liquidity
- Regulatory/Tax Considerations

# Banks

- IDC + ALM
- Net Interest Margin
- Robust Regulation

# Other Taxable Institutions

- Nuclear Decommissioning Trusts
- Personal Injury Trusts

# Non-Taxable Investors

- Opportunistic
- Capital Appreciation vs. Taxable Bonds

# Client Objectives – Policy Statement

Client Guidelines:

- Investment Objectives
- Investment Universe
- Risk Tolerance

# Investment Vehicles

- Mutual Funds
- ETFs
- Closed End Funds
- SMAs



# Mutual Fund Characteristics

- Actively managed
- Trade at close of business at NAV
- Daily liquidity

# Types of Mutual Funds

- Maturity/Duration
- Investment Grade
- High Yield
- Single State
- Money Market

# ETFs

- Track an index
- Trade on an exchange
- Price can vary from Net Asset Value

# Index Funds and Tracking Error

## Tracking Error

- How closely the fund tracks its benchmark
- Expressed as the standard deviation of the difference in returns

## Average Annual Tracking Error (2012-2021)\*

### Largest Funds

S&P 500	0.02
Bloomberg Aggregate	0.11
Russell 2000	0.21

# Muni ETF Tracking Error (6/23/23)

Years

	1	3	5
MUB Tracking Err	1.04%	0.72%	0.59%

Source: Seeking Alpha

# Closed-End Funds

- Set \$\$ amount raised
- Trade on an exchange
- Price varies from NAV
- Leverage

# Separately Managed Accounts

- Active
- Laddered
- Hybrid

# Active Management

- Manager discretion
- Precise customization
- Institutional accounts



# Portfolio “Ladders”

- Passive
- “Mass Customization”

# Considerations for Ladders

- “Spacing”
- Quality
- Liquidity
- Callable bonds

# Hybrid Portfolios

- Ladder +
  - ETF
  - Crossover
  - Tax Loss Harvesting

# Active Portfolio Management

# Client Guidelines: Municipal Bond Portfolio

- *Objective:* Generate tax exempt income while preserving capital, diversify overall client portfolio.
- *Performance objective:* Outperform the Barclay's 1-10 Year Muni Index on a rolling 3 year basis
- *Investment Universe:* Municipal bonds rated BBB- or higher by at least one NRSRO
- *Duration:* +/- 0.5 years vs. index.
- *Limits:* Holdings of a single obligor cannot exceed 2.5% of total portfolio value.

# The Portfolio Management Process: The Pillars of Portfolio Management

- Credit Research
- Trading
- Relative Value Analysis
- Interest Rate/Yield Curve Analysis
- Risk Management
- Compliance

# Credit Research

- Focus on the future
- Improving/Stable/Declining
- Volatility of rating changes

# Credit Research

- Scenario analysis
- Diversification/correlation
- Work efficiently



# Credit and Value

Credit quality

- + credit trend
- + yield spread
- + liquidity

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= Relative Value

# Trading

- Information Collection
- New Issues
- Secondary Market
- Workflow
- Selling

# Trading – New Issue Calendar

-Bloomberg (and S&P) display new issue deal calendar each week.

1) Edit Columns		2) Actions		3) Export to Excel		4) Historical Supply		Municipal Fixed Rate Calendar	
Date	07/10/2023	-	MM/DD/YYYY						
Date	↑ Issuer Description	State	Amt (MM)	Tax	Senior Manager	Type	Industry		
			50						
11)	07/10/2023 ARKANSAS UNIV-REF-REV	AR	64.630	N	JP MORGAN SECUR...	NEGT	Higher Education		
12)	07/10/2023 AZ IND DEV AUTH-A-1	AZ	173.535	N	CITIGROUP GLOBA...	NEGT	Continuing Care Reti..		
13)	07/10/2023 CA MUNI FIN AUTH - A-1	CA	228.625	N	CITIGROUP GLOBA...	NEGT	Continuing Care Reti..		
14)	07/10/2023 CA MUNI FIN AUTH-A-2-CABS	CA	104.694	N	CITIGROUP GLOBA...	NEGT	Continuing Care Reti..		
15)	07/10/2023 CADDO MILLS ISD	TX	79.410	N	STIFEL NICOLAUS ...	NEGT	School District		
16)	07/10/2023 CASCADE CO -REV -AMT	MT	250.000	A	CITIGROUP GLOBA...	NEGT	Economic/Industrial..		
17)	07/10/2023 CHAPEL HILL ISD	TX	100.000	N	PIPER SANDLER & ...	NEGT	School District		
18)	07/10/2023 COPPELL ISD	TX	71.885	N	RAYMOND JAMES &...	NEGT	School District		
19)	07/10/2023 CT HSG FIN AUTH -B-REF	CT	146.830	N	CITIGROUP GLOBA...	NEGT	State Single-Family ..		
20)	07/10/2023 CUMBERLAND VLY SD-A	PA	53.500	N	STIFEL NICOLAUS ...	NEGT	School District		
21)	07/10/2023 DALLAS HSG FIN CORP-A	TX	84.250	N	GOLDMAN SACHS &...	NEGT	Local Multi-Family H..		
22)	07/10/2023 DENTON ISD	TX	949.075	N	PIPER SANDLER & ...	NEGT	School District		
23)	07/10/2023 FORT BEND ISD -B-REMK	TX	90.205	N	ROBERT W BAIRD ...	NEGT	School District		
24)	07/10/2023 GARLAND ISD	TX	145.315	N	RAYMOND JAMES &...	NEGT	School District		
25)	07/10/2023 GRANT CO PUD #2-A-REV-REF	WA	145.525	N	JP MORGAN SECUR...	NEGT	Public Power System		
26)	07/10/2023 HUDSON CO IMPT AUTH -B-1	NJ	75.751	N	OPPENHEIMER & C...	SHNG	General Revenue Ta...		
27)	07/10/2023 ILLINOIS HSG DEV AUTH-H	IL	160.000	N	RAYMOND JAMES &...	NEGT	State Single-Family ..		
28)	07/10/2023 ILLINOIS HSG DEV AUTH-I	IL	76.665	T	LOOP CAPITAL MAR...	NEGT	State Single-Family ..		
29)	07/10/2023 IMPERIAL CMNTY CLG DT -A	CA	50.000	N	PIPER SANDLER & ...	NEGT	Community College ...		
30)	07/10/2023 INTERMOUNTAIN PWR AGY -A	UT	769.695	N	GOLDMAN SACHS &...	NEGT	Public Power System		
31)	07/10/2023 INTERMOUNTAIN PWR AGY -B	UT	67.395	T	GOLDMAN SACHS &...	NEGT	Public Power System		
32)	07/10/2023 IRVING ISD	TX	319.795	N	BOK FINANCIAL SE...	NEGT	School District		
33)	07/10/2023 JARRELL ISD	TX	99.770	N	JP MORGAN SECUR...	NEGT	School District		
34)	07/10/2023 KALAMAZOO PUB SCHS -I	MI	51.535	N	HUNTINGTON SECUR...	NEGT	School District		
35)	07/10/2023 LOS ANGELES -A -REV	CA	174.740	N	JP MORGAN SECUR...	NEGT	Solid Waste		
36)	07/10/2023 LOUISVILLE CO METRO -A	KY	146.360	N	JP MORGAN SECUR...	NEGT	Hospital		
37)	07/10/2023 LOUISVILLE CO METRO -B	KY	117.905	N	JP MORGAN SECUR...	NEGT	Hospital		
38)	07/10/2023 ME HLTH & HGR EDUTNL -A	ME	68.870	N	RAYMOND JAMES &...	NEGT	Hospital		
39)	07/10/2023 MIAMI BEACH-B-TXBL	FL	54.035	T	WELLS FARGO BAN...	NEGT	General Obligation		
40)	07/10/2023 NEW CANEY ISD -REF	TX	223.735	N	PIPER SANDLER & ...	NEGT	School District		
41)	07/10/2023 NM MTGE ETN AUTH-C	NM	100.000	N	RBC CAPITAL MAR...	NEGT	State Single-Family ..		

New issues: Phone: (609)279-3250 Email: [newcsni@bloomberg.net](mailto:newcsni@bloomberg.net)

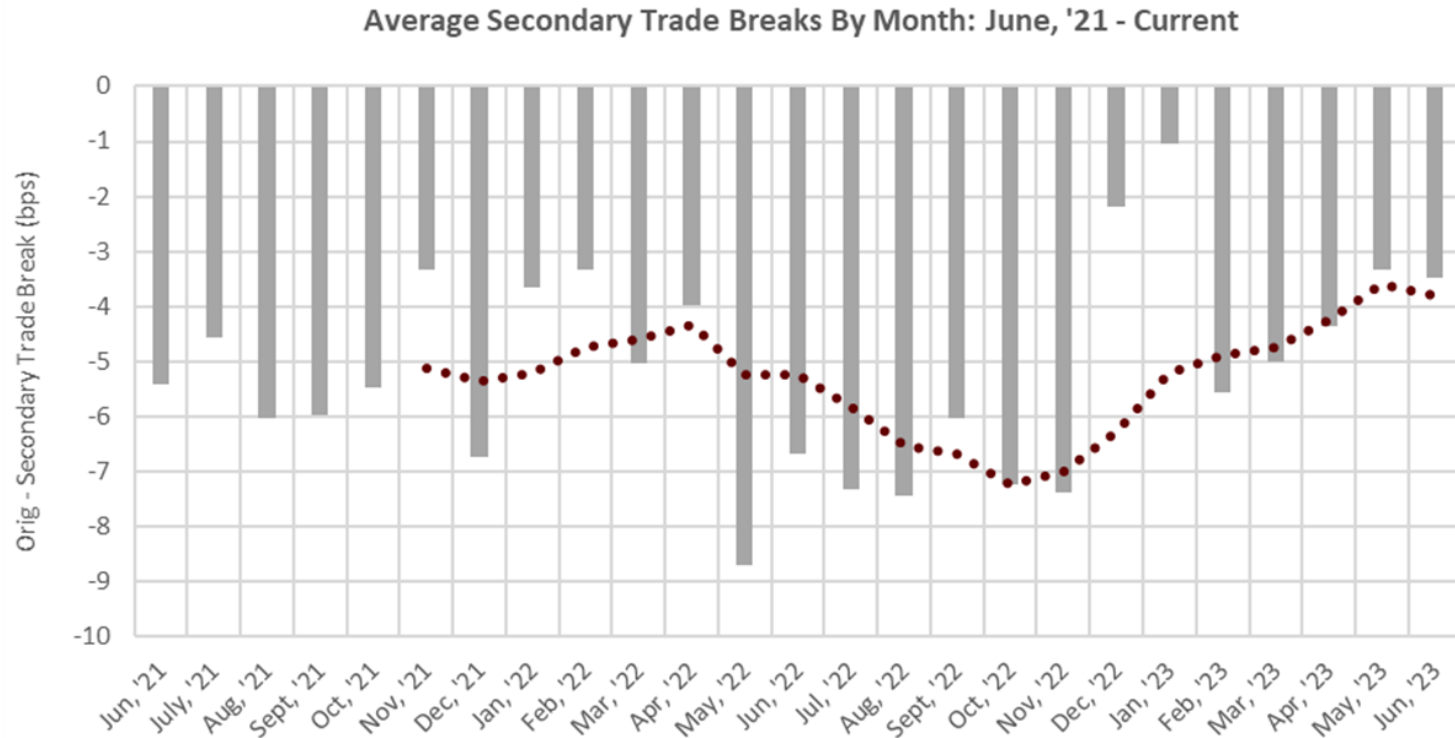
# Trading – New Issue Pricing

-Bloomberg and S&P also show pricing details for each primary market deal.

97) Options ▾		104) Settings		Municipal Fixed Rate Calendar: Negotiated Deal Details						
DENTON ISD		St	TX	Tax	FED	TAX-EXEMPT	Type	NEG	93) Financials	95) Attachments
Summary				Maturity	Amt(M)	Cpn	P/Y	Sprd	CUSIP	FIGI
Sale Date	07/10/23	1		08/15/2024	6045.0	5.000	3.170	13	249002LF1	BBG01H9Y5MR4
Amount	949,075,000.00	2		08/15/2025	12550.0	5.000	3.050	11	249002LG9	BBG01H9Y5MS3
Manager	PIPER SANDLER & CO	3		08/15/2026	14505.0	5.000	2.970	17	249002LH7	BBG01H9Y5MT2
Bond Type	GO ULT	4		08/15/2027	15230.0	5.000	2.890	19	249002LJ3	BBG01H9Y5MV9
Dated Date	07/15/23	5		08/15/2028	15995.0	5.000	2.840	19	249002LK0	BBG01H9Y5MW8
1st Coupon	08/15/23	6		08/15/2029	15685.0	5.000	2.900	28	249002LL8	BBG01H9Y5MX7
Deal number	496024	7		08/15/2030	16470.0	5.000	2.920	33	249002LM6	BBG01H9Y5N01
Rating/Enhancement		8		08/15/2031	17290.0	5.000	2.920	34	249002LN4	BBG01H9Y5N10
Moody's		9		08/15/2032	18155.0	5.000	2.930	36	249002LP9	BBG01H9Y5N29
S&P	AAA (AA)	10		08/15/2033	19055.0	5.000	2.970	36	249002LQ7	BBG01H9Y5N38
Fitch	AAA (AA)	11		08/15/2034	24055.0	5.000	3.050	36	249002LR5	BBG01H9Y5N47
KBRA		12		08/15/2035	25375.0	5.000	3.120	31	249002LS3	BBG01H9Y5N56
Enhancement	PSF-GTD	13		08/15/2036	26095.0	5.000	3.200	24	249002LT1	BBG01H9Y5N65
Schedules		14		08/15/2037	27555.0	5.000	3.300	22	249002LU8	BBG01H9Y5N74
Prem Call		15		08/15/2038	29105.0	5.000	3.420	28	249002LV6	BBG01H9Y5N83
Par Call	08/15/33	16		08/15/2039	30465.0	5.000	3.530	35	249002LW4	BBG01H9Y5N92
Mandatory Tender		17		08/15/2040	29465.0	5.000	3.610	38	249002LX2	BBG01H9Y5NB9
Other Info		18		08/15/2041	29205.0	5.000	3.690	42	249002LY0	BBG01H9Y5NC8
1st Settle	08/10/23	19		08/15/2042	30665.0	5.000	3.750	43	249002LZ7	BBG01H9Y5ND7
Form/Dep	BOOK-ENTRY,DTC	20		08/15/2043	36305.0	5.000	3.800	45	249002MA1	BBG01H9Y5NF5
Price Status	FINAL	21		08/15/2048	233475.0	5.000	4.020	51	249002MB9	BBG01H9Y5NM7
		22		08/15/2053	276330.0	5.000	4.080	51	249002MC7	BBG01H9Y5NV7
Notes	DENOMS: \$5,000/\$5,000 INTEREST ACCRUES FROM DELIVERY DATE									

# Trading – Secondary Breaks

-A secondary break measures the basis point difference between a bonds original issue yield and first secondary traded yield.



# Trading – Secondary Market Offerings

-Bonds will then also be offered for sale in the secondary market after initial pricing.

All Offerings		Views	Actions	Settings	Page 1/417 Muni Offerings		
Filters: Include: PICK Off... All States Multiple Tax Statu... All Sizes All Filters: 3							
Total Number of Items: 4500+							
25M	NY	BATTERY PARK CITY NY AUTH REF-SENIOR REV-SE-	5.000	11/01/34	2.632 (NET)	PICK	
Aaa/NA/AAA/NA	NONE	CA:29@100.000	EXEMPT	07133AHS4	MILLADV (980)213-2345		
135M	TX	TRAVIS CNTY TX CTFS OBLIG-SER A	5.000	03/01/27	2.812 (NET)	PICK	
Aaa/AAA/NA/NA	NONE	NON-CALLABLE	EXEMPT	89453PG78	MILLADV (980)213-2345		
25M	NJ	MERCER CNTY NJ IMPT AUTH REVEN REF-COUNTY S.	5.000	04/01/28	2.700 (NET)	PICK	
NA/AA+/NA/NA	NONE	NON-CALLABLE	EXEMPT	587845JX7	1ST TRYON (704)831-5038		
25M	NJ	MONMOUTH CNTY NJ IMPT AUTH REV GOVTL POOLE-	5.000	01/15/26	2.850 (NET)	PICK	
Aaa/AAA/AAA/NA	CNTY GTD	NON-CALLABLE	EXEMPT	60956PRX2	1ST TRYON (704)831-5038		
25M	NJ	BURLINGTON CNTY NJ BRIDGE COMM SER A	5.000	04/15/31	2.680 (NET)	PICK	
Aa1/AA/NA/NA	NONE	CA:29@100.000	EXEMPT	121651LW1	1ST TRYON (704)831-5038		
200M	CA	SAN JOSE CA REDEV AGY SUCCESSO REF-SUB-SER B	5.000	08/01/26	2.800 (NET)	PICK	
NA/AA-/AA-/NA	NONE	NON-CALLABLE	EXEMPT	798170BA3	1ST TRYON (704)831-5038		
20M	MA	BROOKLINE MA	5.000	03/15/26	2.750 (NET)	PICK	
Aaa/AAA/NA/NA	NONE	NON-CALLABLE	EXEMPT	1137456B4	1ST TRYON (704)831-5038		
25M	NJ	NEW JERSEY ST TURNPIKE AUTH TU REF-SER E	5.000	01/01/30	2.850 (NET)	PICK	
A1/AA-/A+/NA	NONE	CA:28@100.000	EXEMPT	646140BZ5	1ST TRYON (704)831-5038		
20M	CA	SOUTHERN CA WTR REPLENISHMENT REF	5.000	08/01/25	2.850 (NET)	PICK	
NA/AA+/AA+/NA	NONE	NON-CALLABLE	EXEMPT	84251KAK1	1ST TRYON (704)831-5038		
120M	OR	EUGENE OR WTR REVENUE REF-UTIL SYS	5.000	08/01/26	2.830 (NET)	PICK	
Aa2/AA/AA+/NA	NONE	NON-CALLABLE	EXEMPT	298245JQ5	1ST TRYON (704)831-5038		
95M	TN	TENNESSEE ST SER A	5.000	08/01/25	2.943 (NET)	PICK	
Aaa/AAA/AAA/NA	NONE	NON-CALLABLE	EXEMPT	880541VL8	1ST TRYON (704)831-5038		
90M	NJ	MERCER CNTY NJ IMPT AUTH REVEN REF-COUNTY S.	5.000	04/01/26	2.830 (NET)	PICK	
NA/AA+/NA/NA	NONE	NON-CALLABLE	EXEMPT	587845JV1	1ST TRYON (704)831-5038		

# Workflow Management

Collect data →

Optimization Program →

Security Selection →

Trade Execution

# Workflow Management

- Live Offerings + Pricing => Data Aggregation



# Workflow Management

Optimization =

Yield Spread + Structure + Maturity + Quality →

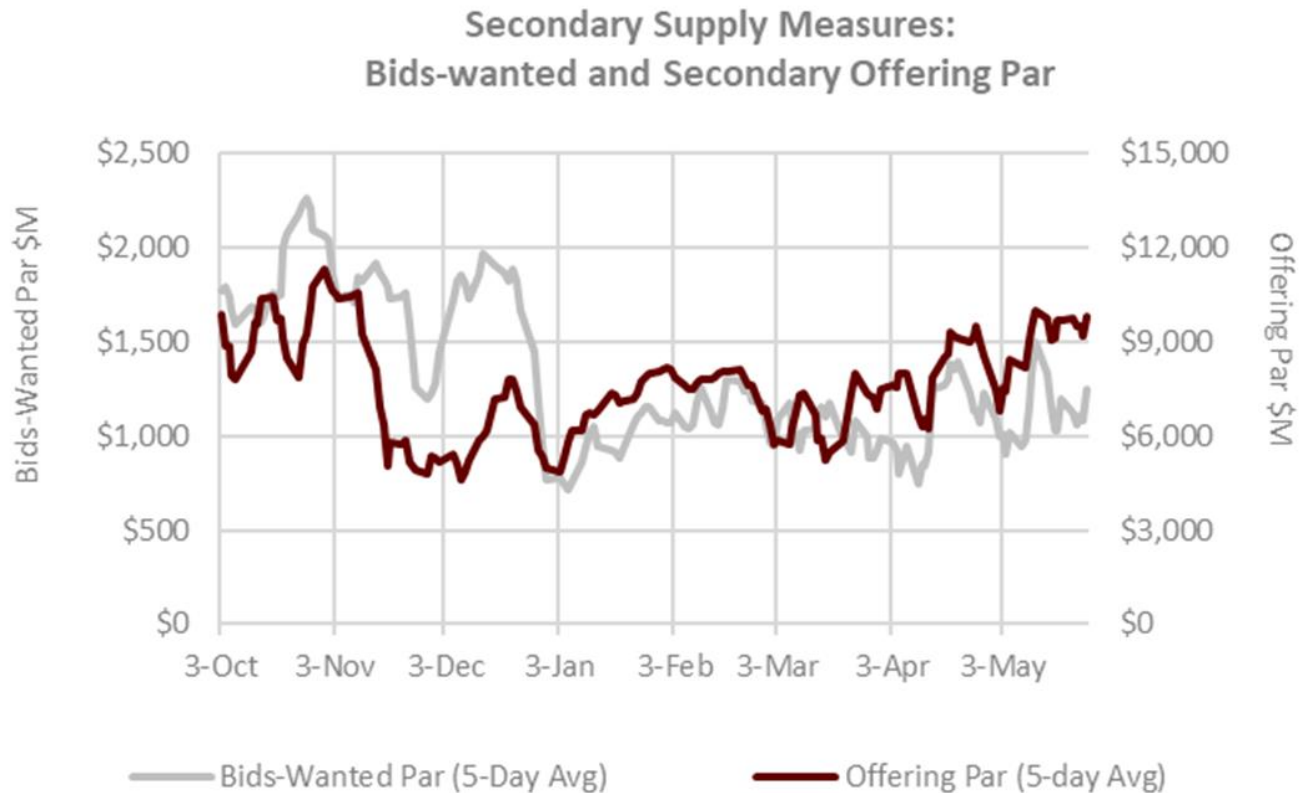
Portfolio Requirements

# Workflow Management

Bidding for Bonds → Trading Desk → Manual or Electronic Execution

# Selling Bonds – Bids-Wanted and Offerings

-Bond investors can put bonds out for sale and solicit a price via the bids-wanted process, or they can offer bonds at a defined price via a secondary offering.



# Relative Value Analysis

- Credit spreads
- Liquidity factors
- Diversification
- Optionality/callable bonds
- Market Discount Rule
- Double Tax Exemption
- Crossover trades
- Seasonality

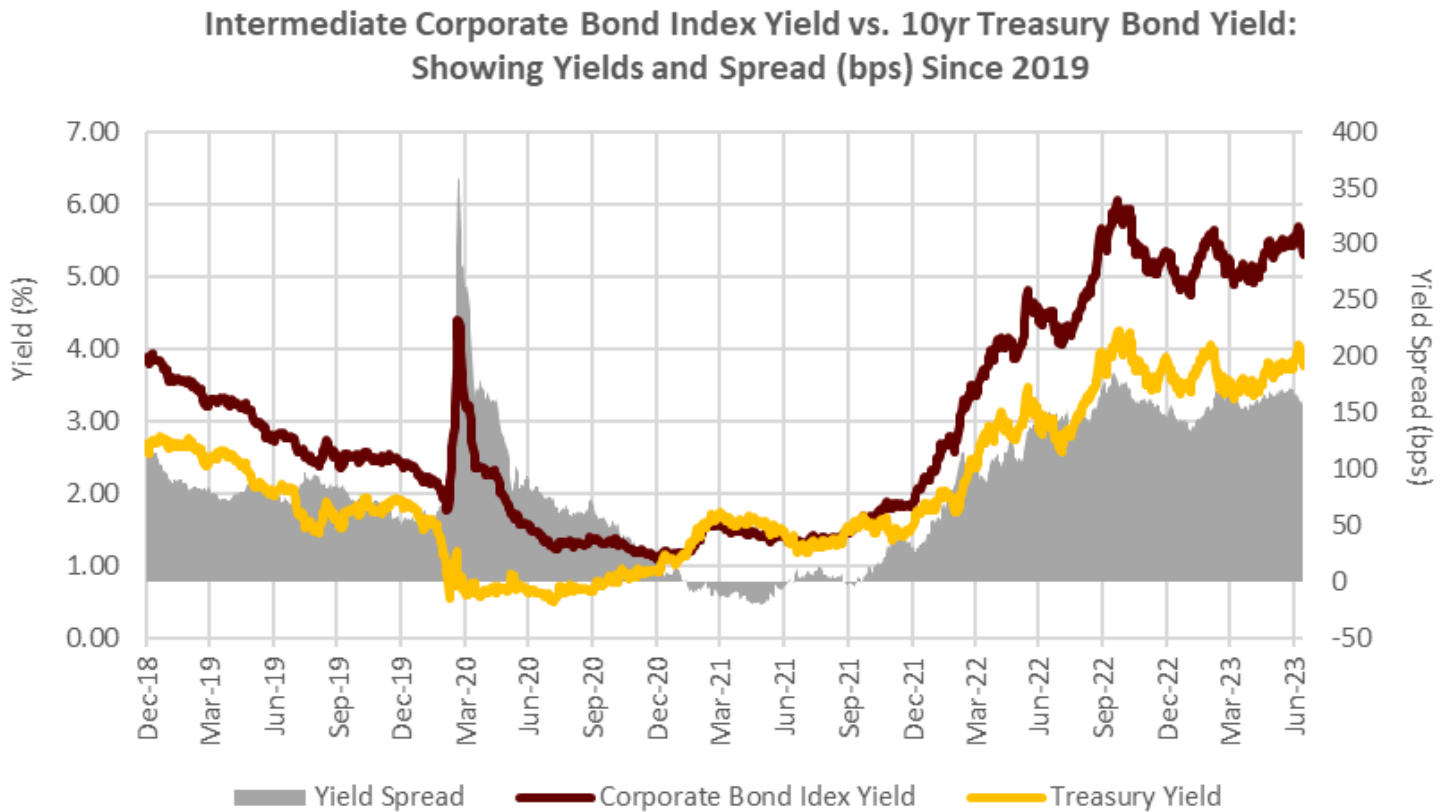
# Building Blocks of Bond Yield

Bond Yield =

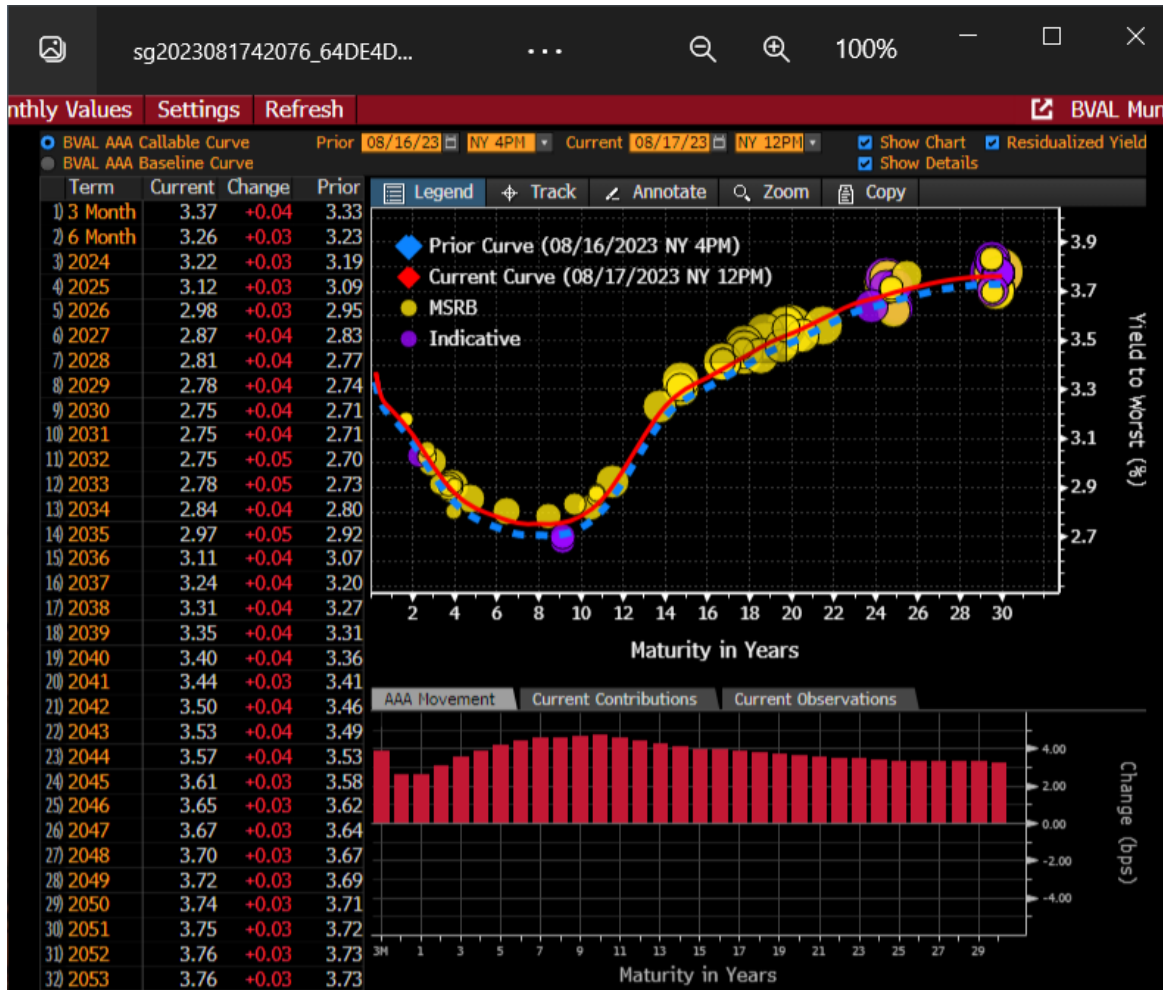
- Real risk-free rate
- + Inflation premium
- + Term premium
- + Credit risk premium
- + Liquidity premium

# Corporate vs. Treasury Yields

-Yield Spread: Intermediate Corp Bond Index Yield vs. the 10yr Treasury yield



# AAA Municipal Pricing Benchmark



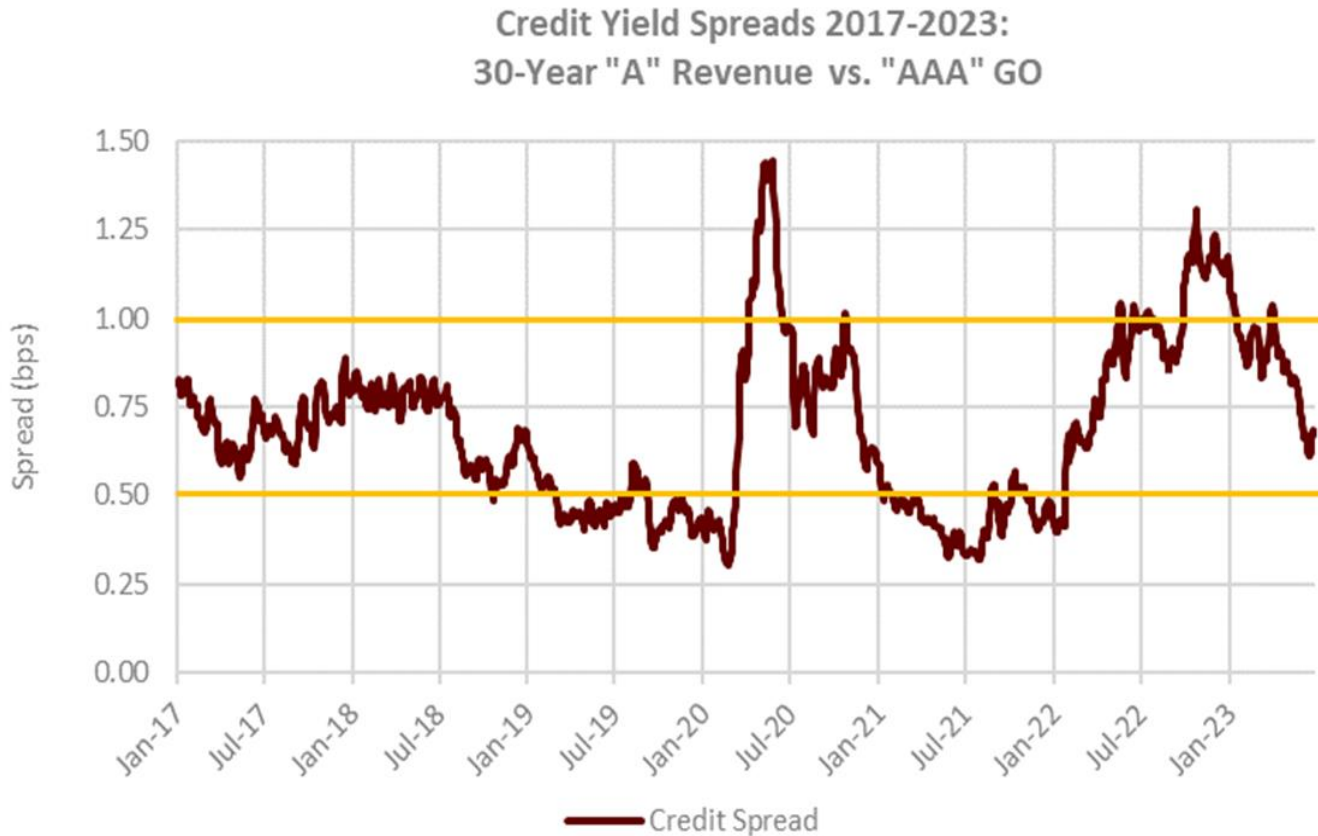
# 10yr Spreads to AAA Benchmark

Issuer/Rating	Maturity	Coupon	AAA Yield	Traded Yield	Trade Date	Yield Spread
Denton, TX ISD (NR/AAA/AAA)	2033	5%	2.61	2.97	7/10/2023	36
Washington GO (Aaa/AA+/AA+)	2033	5%	2.45	2.63	7/25/2023	18
New York City GO (Aa2/AA/AA)	2033	5%	2.69	3.09	8/7/2023	40
Georgia GO (Aaa/AAA/AAA)	2033	5%	2.51	2.51	6/27/2023	0
Wisconsin GO (Aa1/AA+)	2033	5%	2.69	2.85	8/15/2023	16



# A-AAA Long Bond Credit Spread

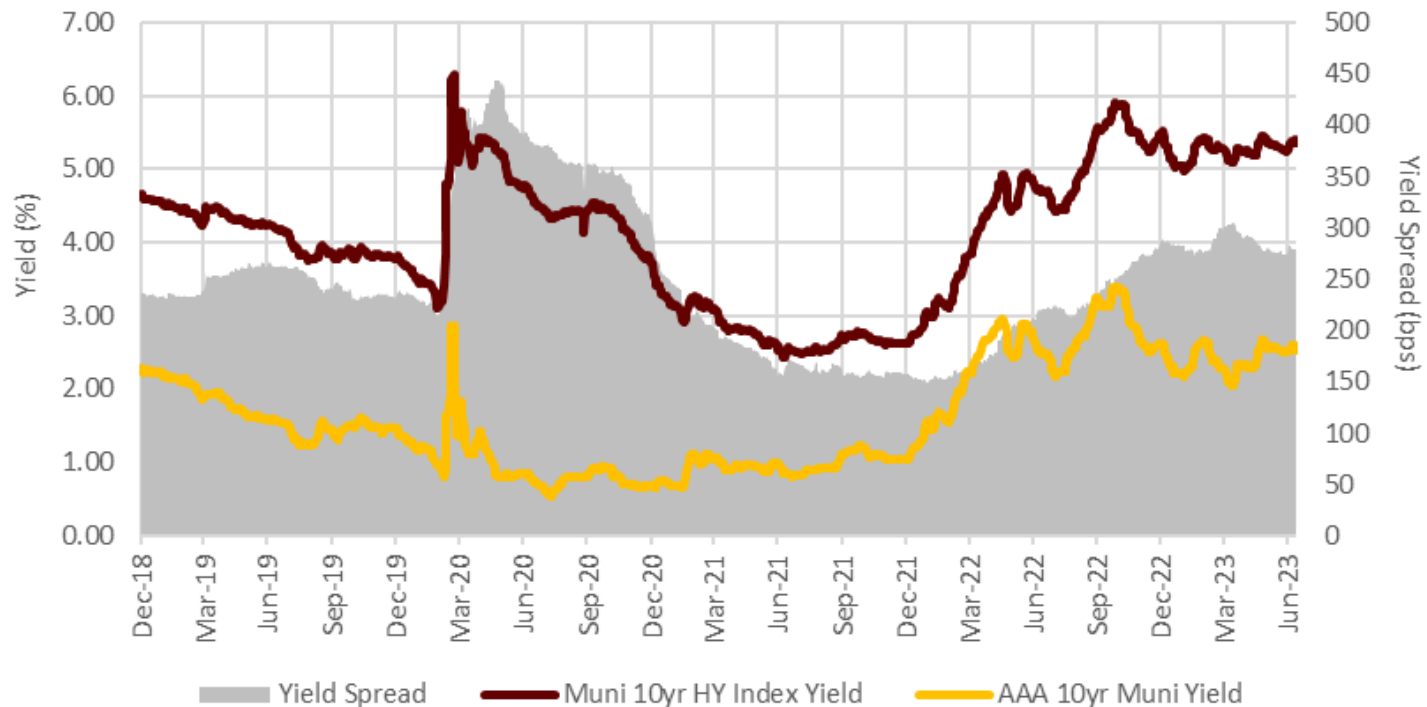
-Showing the yield spread between Bloomberg's A vs. AAA long duration indices.



# High-Yield vs. High-Grade Municipal Yields

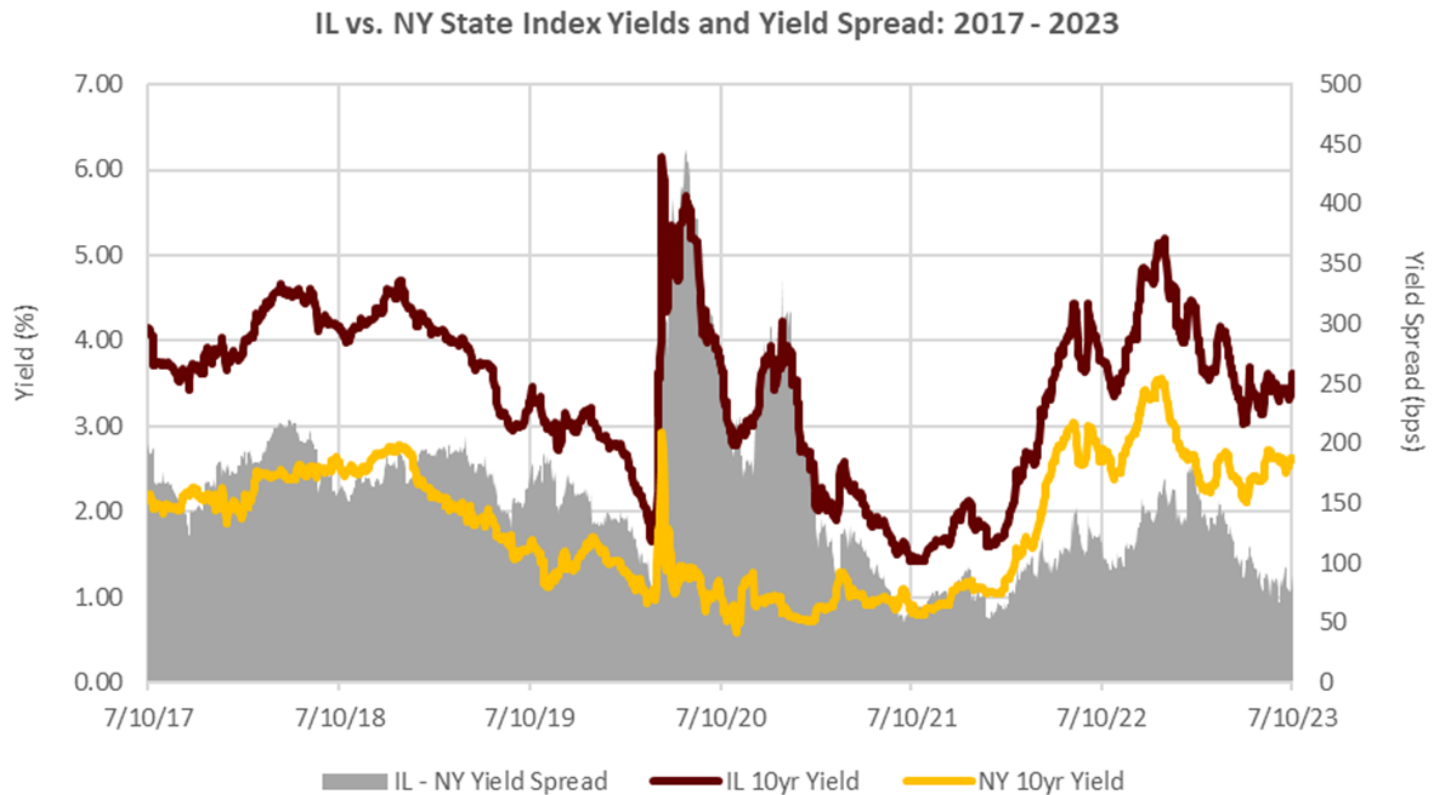
-Yield spread between intermediate high-yield municipal bond index and the 10-year AAA municipal bond.

Municipal HY Index Yield vs. 10yr AAA Municipal Yield:  
Showing Yields and Spread (bps) Since 2019



# IL and NY State Index Yields & Credit Spread

-Showing movement in yields and yield spread between 2017 – 2Q23



# Liquidity Factors

- Rating/outlook
- Size of issue
- Size of holding
- Name recognition
- Structure
- Sector
- Age of bond
- Yield

# Selling Bonds – Bid to Ask Spread

Ask – price at which a seller is willing to sell

Bid – price at which a buyer is willing to buy

# Selling Bonds – Bid to Ask Spread

- PM – puts a bond out for bid
- Dealers – bid in competition
- PM – sells to high bid or further negotiates sale price
- Dealer – re-offers bond to other buyers at higher price

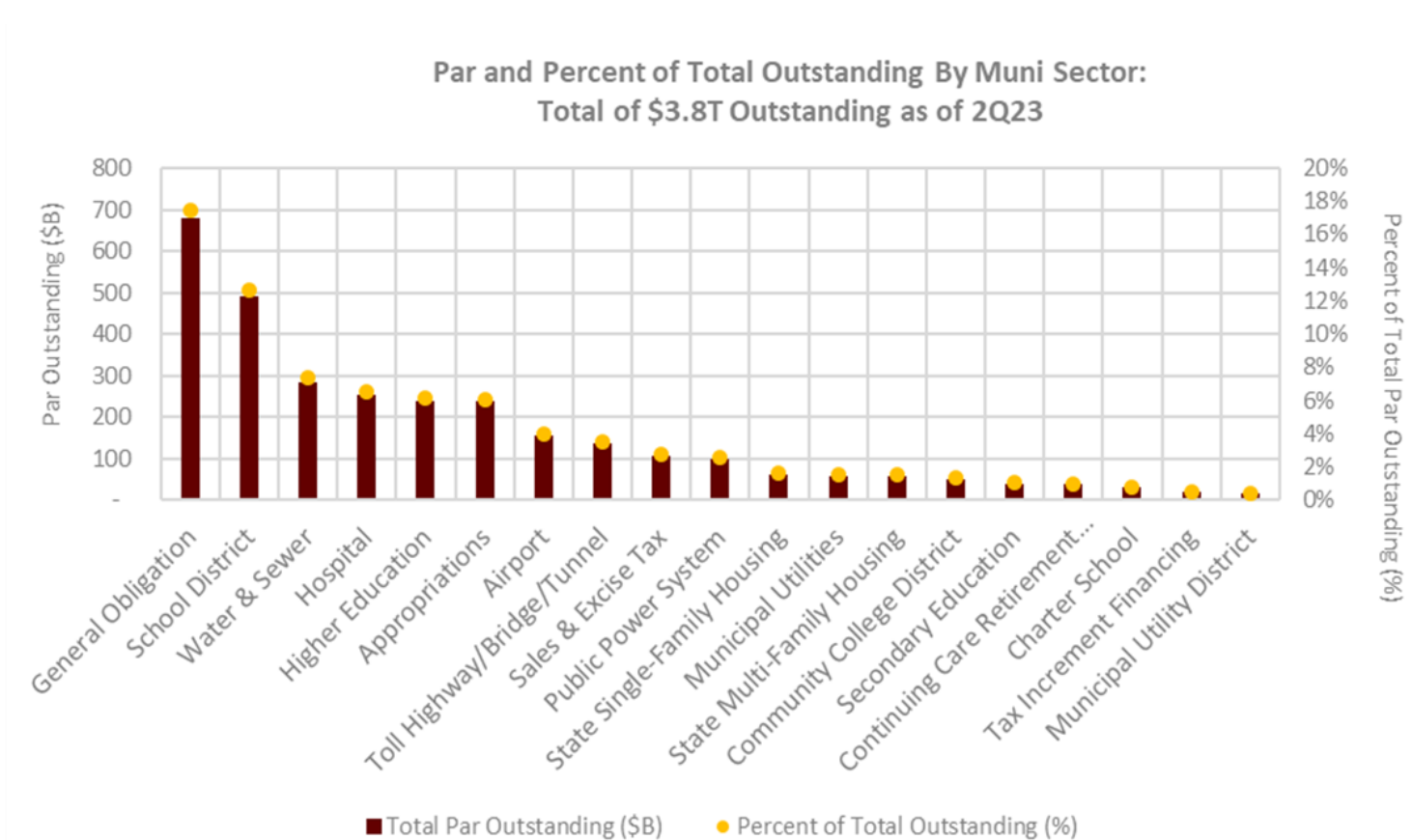
# Liquidity

-Showing changes in institutional vs. retail trading activity between 2021 – 2Q23



# Diversification Across Municipal Sectors

-Showing par and percent of total outstanding, by SECTOR, as of 2Q23.

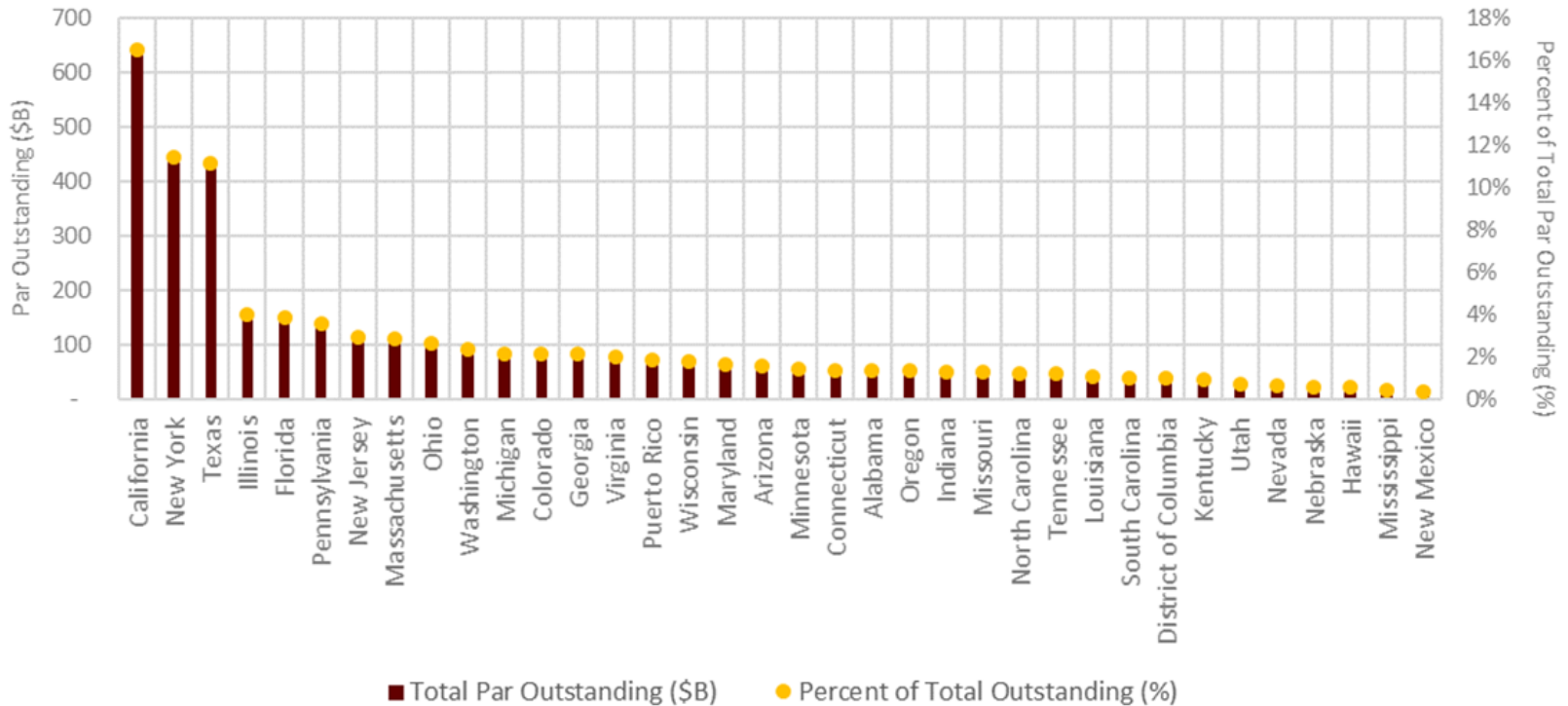




# Diversification Across Municipal States

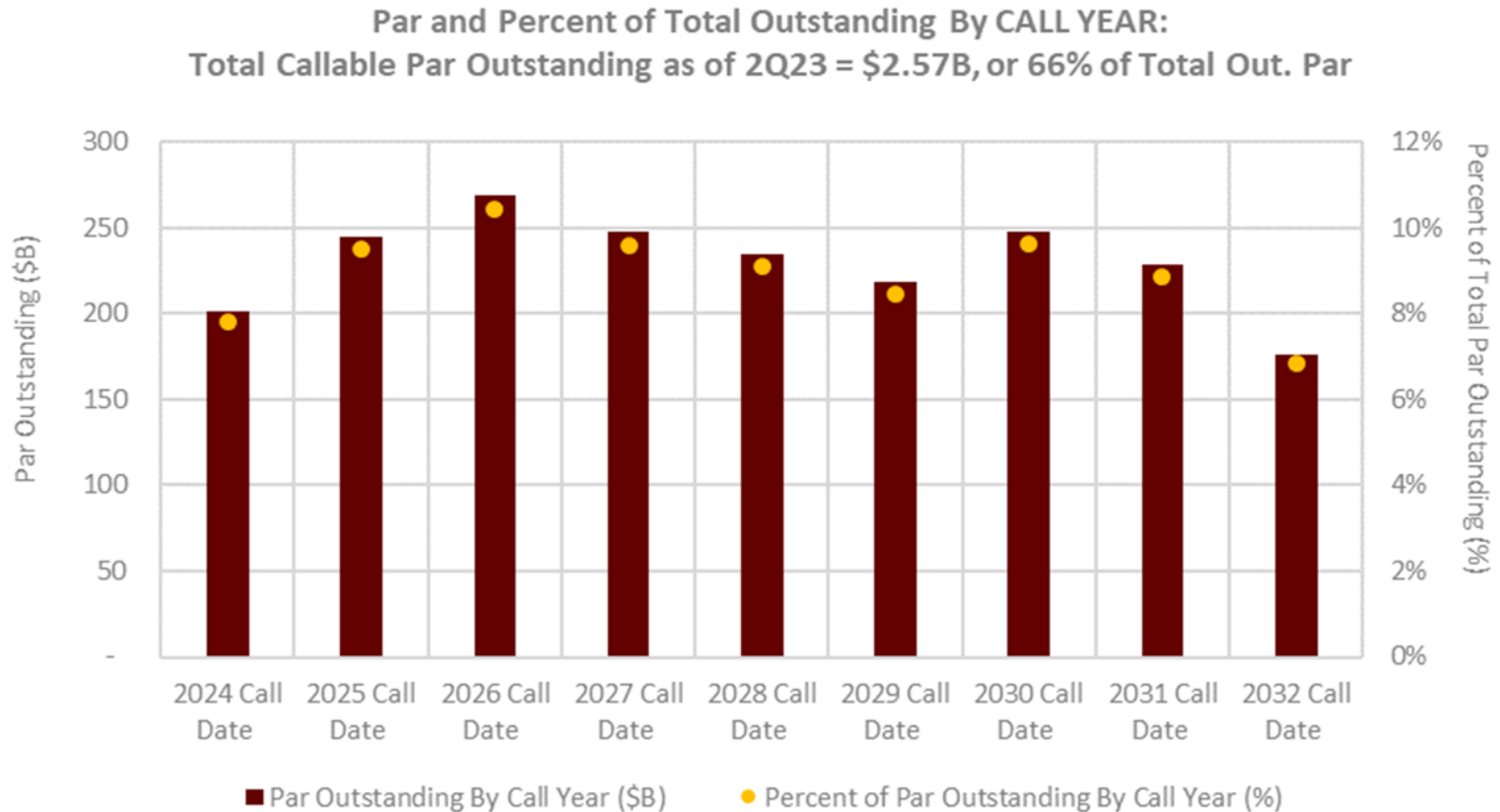
-Showing par and percent of total outstanding, by STATE, as of 2Q23.

Par and Percent of Total Outstanding By State:  
Total of \$3.8T Outstanding as of 2Q23



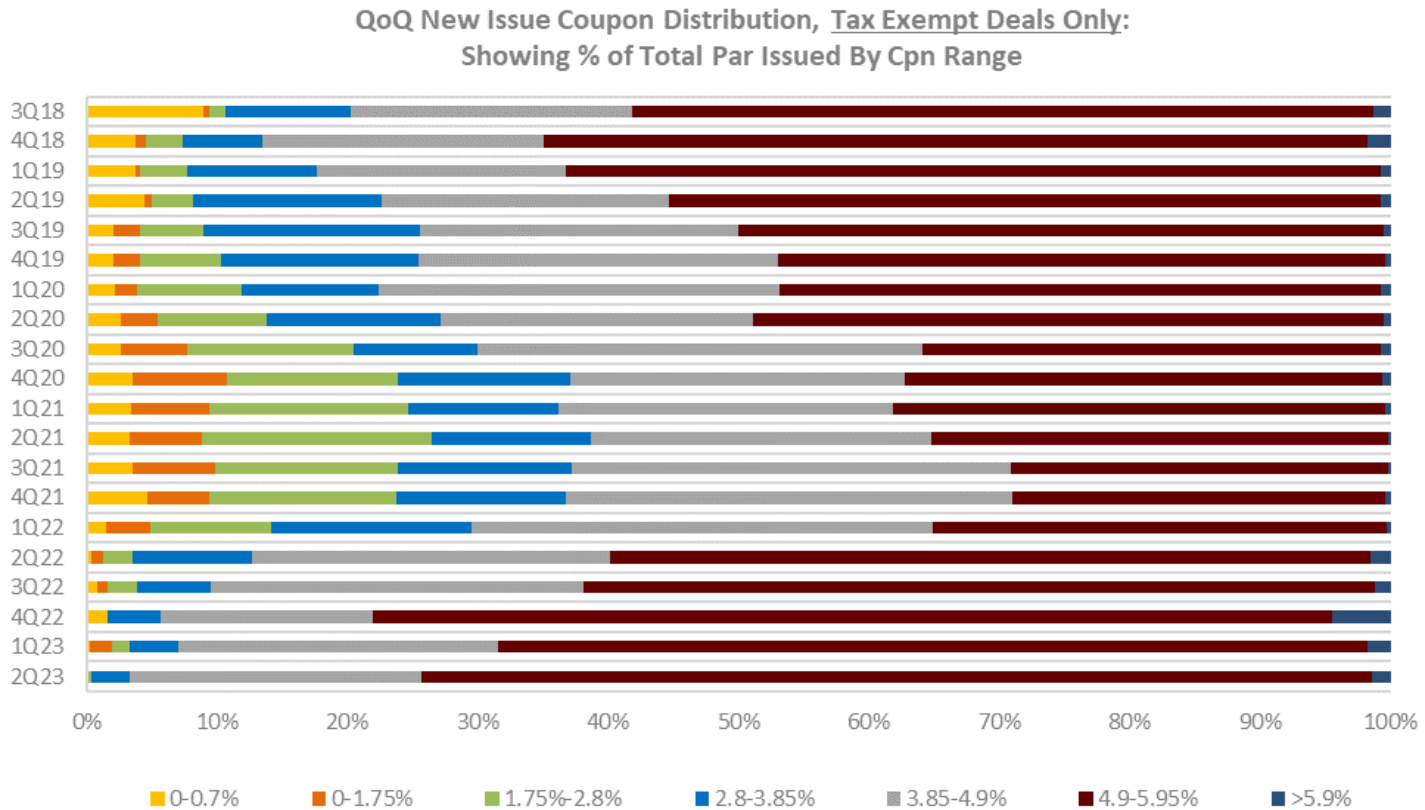
# Percent of Outstanding Par With Calls

-As of 2Q23, 66% of total outstanding municipal par has a call date



# New Issue Coupon Distribution by Quarter

-Showing Re-Rise of 5% Coupon Structures



# Option Adjusted Spread: CA GO Example

**OPTION-ADJUSTED SPREAD ANALYSIS**  
 CALIFORNIA ST (CA) CAS 5 10/01/45 DATED: 04/13/23 MSRB

Calculate **Price** **OAS (bp)** **Volatility**  
 (P,0,V)  P) 112.3791 0) +52.73 V) 7.50

Cusip / ID# 13063D4D7 Option Px Value: -3.16  
 Settle 7/14/2023 Vega: -0.40

2) Customize  
 Curve M49 Semi  
 "AAA" GO Yield Cu  
 Dated 7/12/2023  
 Settle 7/14/2023

Shift +0(bps)  
 Yield

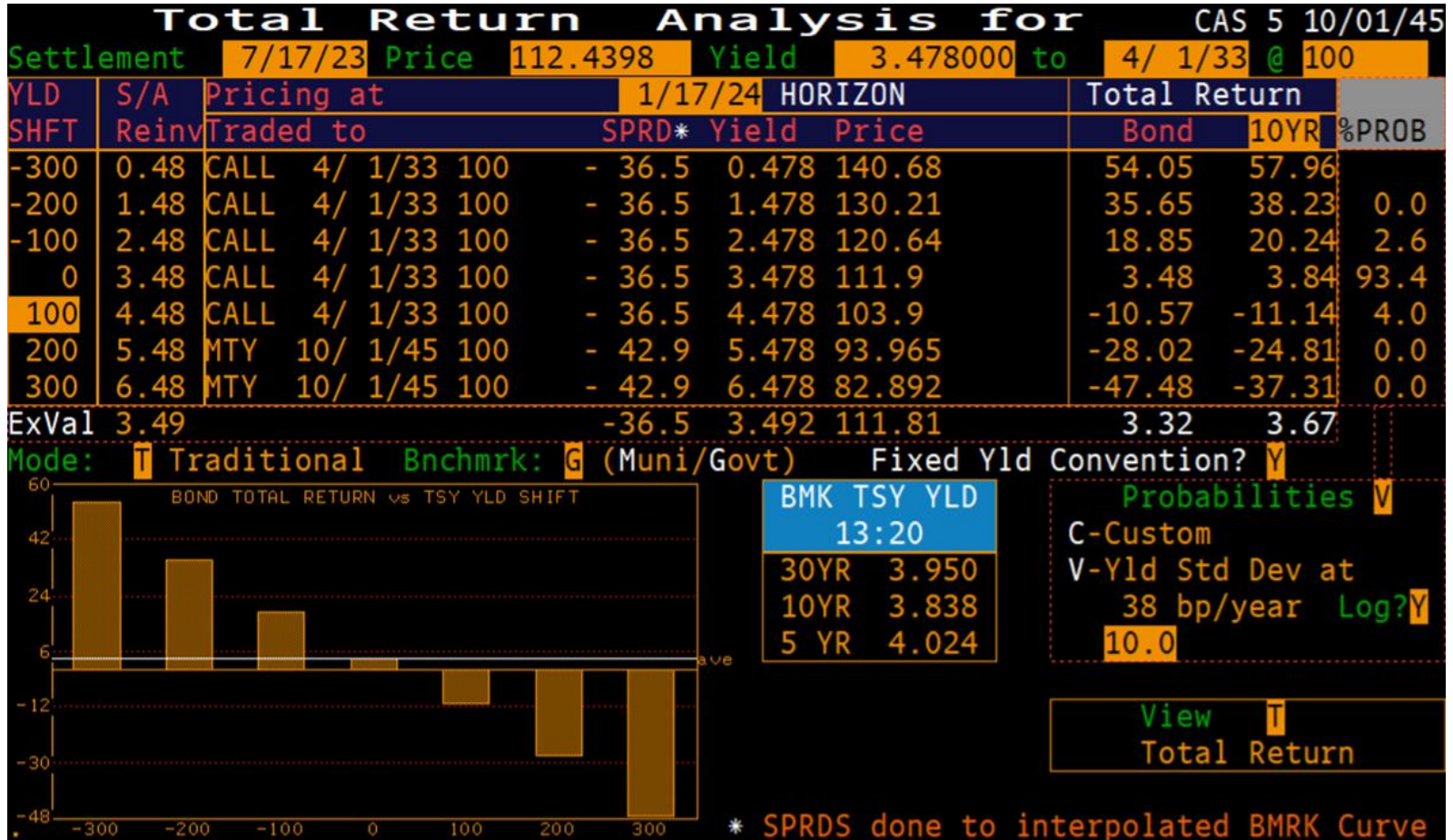
	OAS Method	Option Free	To Call on 4/ 1/2033	To Mty	Yield
3m	Yld	3.943	3.486	4.142	3.130
6m	Sprd	47.1	88.7	67.0	3.100
1y	M Dur	11.20	7.72	13.72	3.060
2y	Risk	12.74	8.77	15.61	2.960
3y	Cnvx	-0.71	0.72	2.55	2.820
4y					2.720
5y					2.660
7y					2.600
10y					2.610
20y					3.380
30y					3.620

{NUM}<GO> for:  
 3) Call Schedule  
 4/ 1/33 100.00  
 4/ 1/34 100.00  
 4/ 1/35 100.00  
 4/ 1/36 100.00  
 4/ 1/37 100.00  
 4/ 1/38 100.00  
 4/ 1/39 100.00  
 4/ 1/40 100.00  
 4/ 1/41 100.00  
 4/ 1/42 100.00  
 ...more...

Model  L=Lognormal  
 Exercise Premium 0.00

88) REFRESH

# Total Return Analysis



# Market Discount (De Minimis Rule)

- The accretion of a bond purchased at a discount is subject to taxation. The tax applied may be capital gains or ordinary income, or a portion of both, depending on the size of the discount. The de minimis threshold =  $\text{par} - (0.25 \times \text{number of years to maturity})$ .

# Effect of Double/Triple Taxation

-Showing yield advantage for CA resident buying in-State bond.

<b>Issuer/Rating/Coupon/Maturity</b>	<b>Traded Yield</b>	<b>Federal Tax</b>	<b>State Tax</b>	<b>Yield for CA Resident</b>
City of Temple TX, GO (AA) 5s of 2031	2.80%	37%	0	2.46%
State of CA, GO (AA) 5s of 2031	2.80%	37%	12.30%	2.80%

## Muni/Treasury Ratios

-Measuring municipal yields over Treasury yields at spot maturities along the curve.

Ratios			
Maturity	Municipal Yield	Treasury Yield	Muni/UST Ratio
2YR	2.91%	4.68%	62.18%
5YR	2.60%	3.94%	65.99%
10YR	2.54%	3.71%	68.46%
30YR	3.52%	3.81%	92.39%



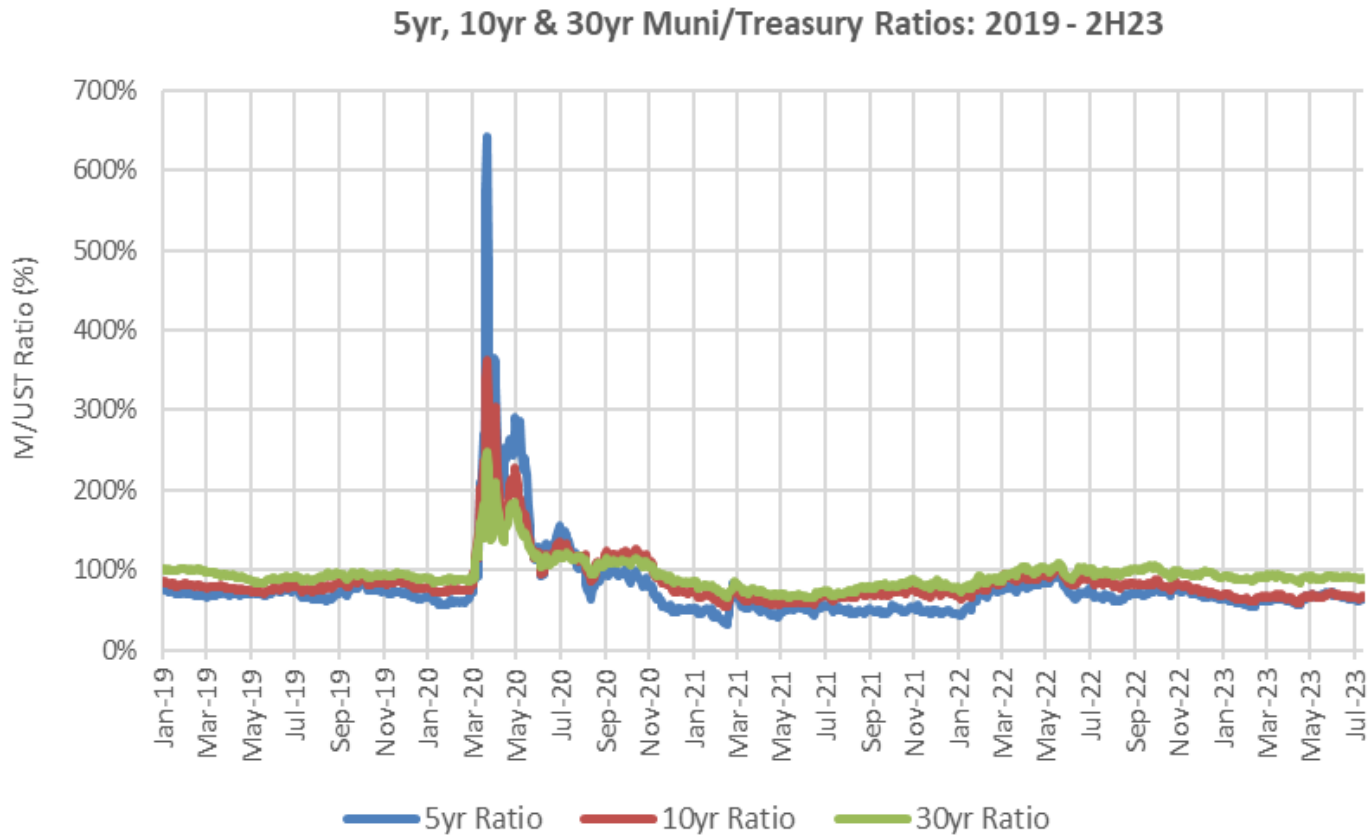
# Muni/Treasury Ratios

-Ratios can also be measured in standard deviations (i.e., current vs. 3-month average ratio, measured in standard deviations).

<b>Maturity</b>	<b>Muni 5% AAA Consensus</b>	<b>Treasury</b>	<b>% to Trsry</b>	<b># of SD</b>
<b>1yr</b>	3.16	5.21	60.7%	0.5
<b>2yr</b>	2.95	4.73	62.4%	-0.3
<b>5yr</b>	2.52	3.99	63.2%	-0.7
<b>10yr</b>	2.80	3.77	74.3%	-1.4
<b>15yr</b>	3.11	n/a	n/a	n/a
<b>20yr</b>	3.26	n/a	n/a	n/a
<b>30yr</b>	3.38	3.85	87.8%	0.2

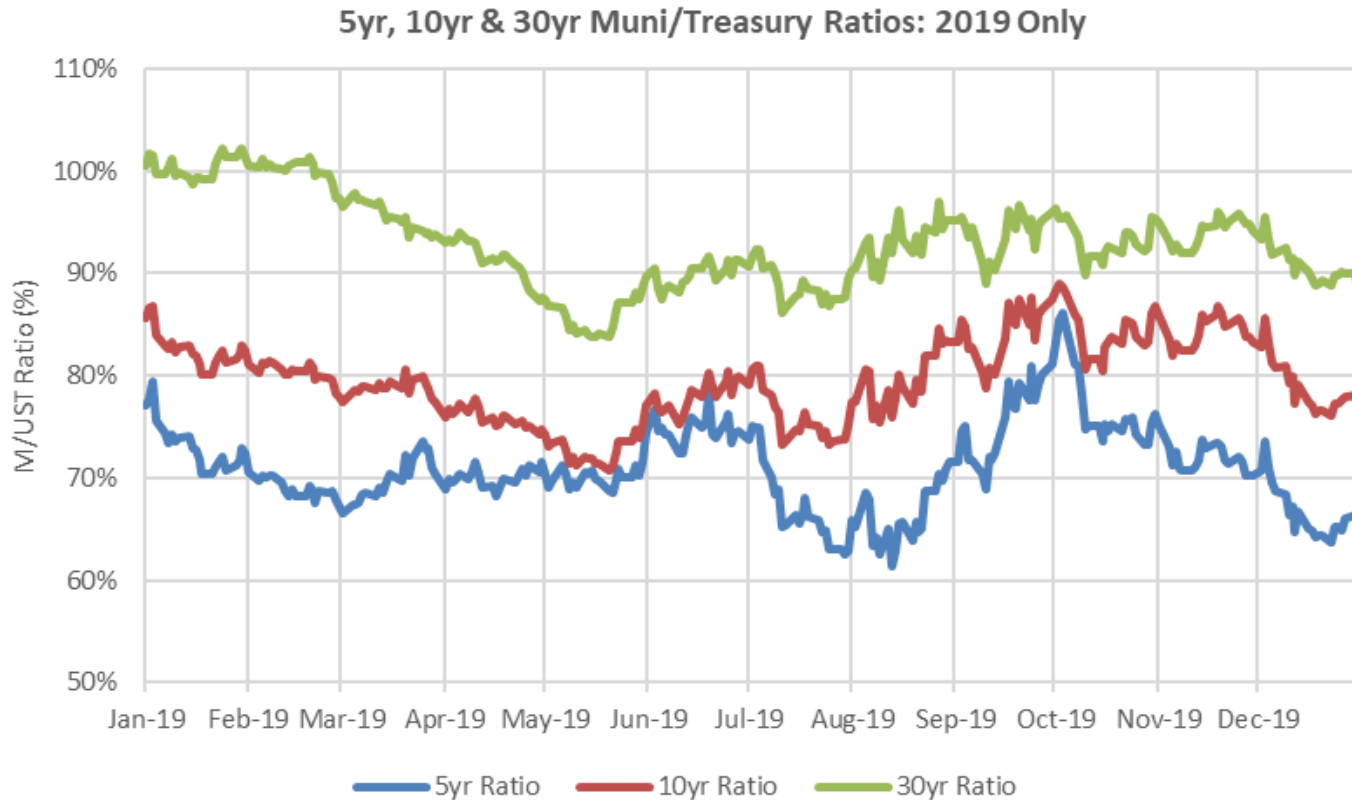
# Muni/Treasury Ratios

-Showing 5yr, 10yr and 30yr ratios between 2019 - 2H23, including March, 2020



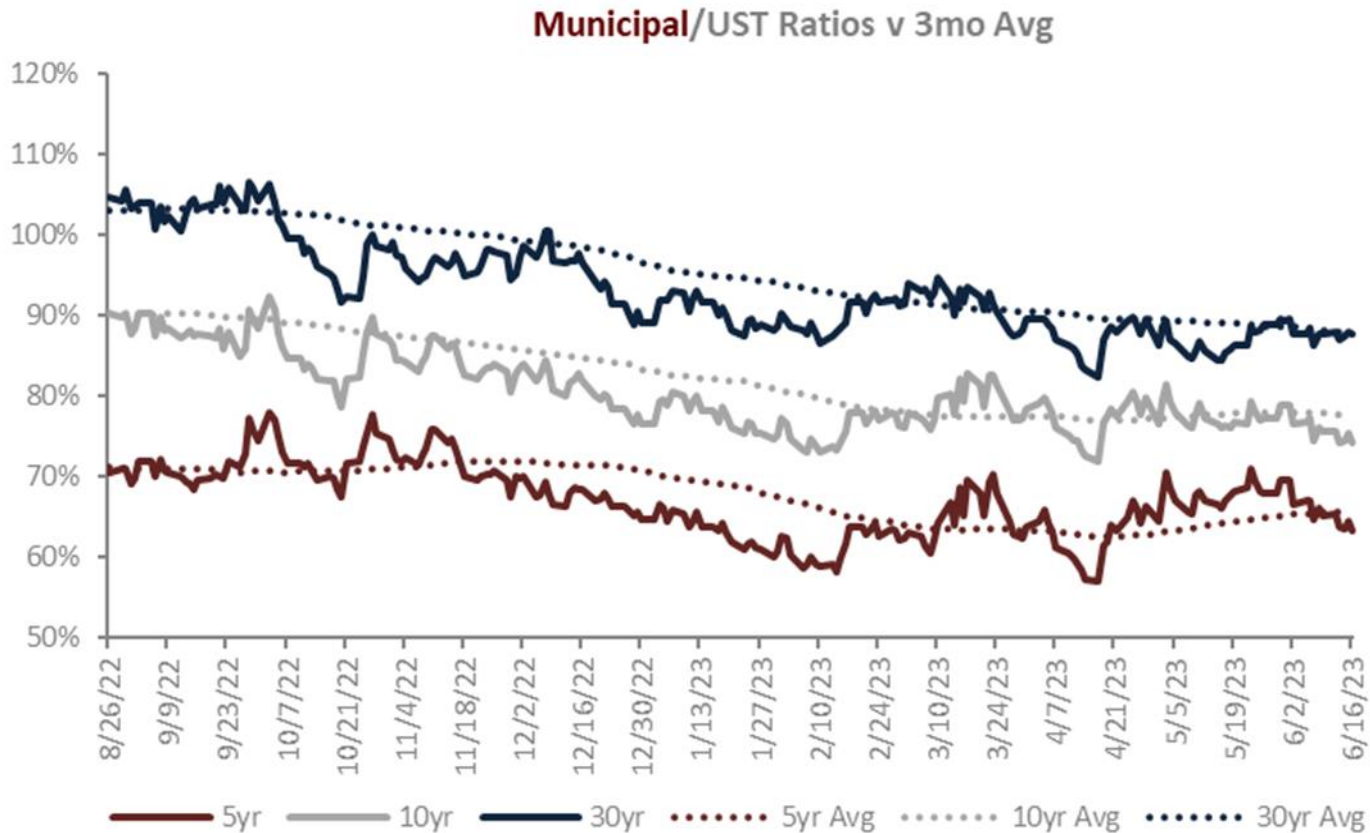
# Muni/Treasury Ratios

-Showing 5yr, 10yr and 30yr ratios for 2019 only



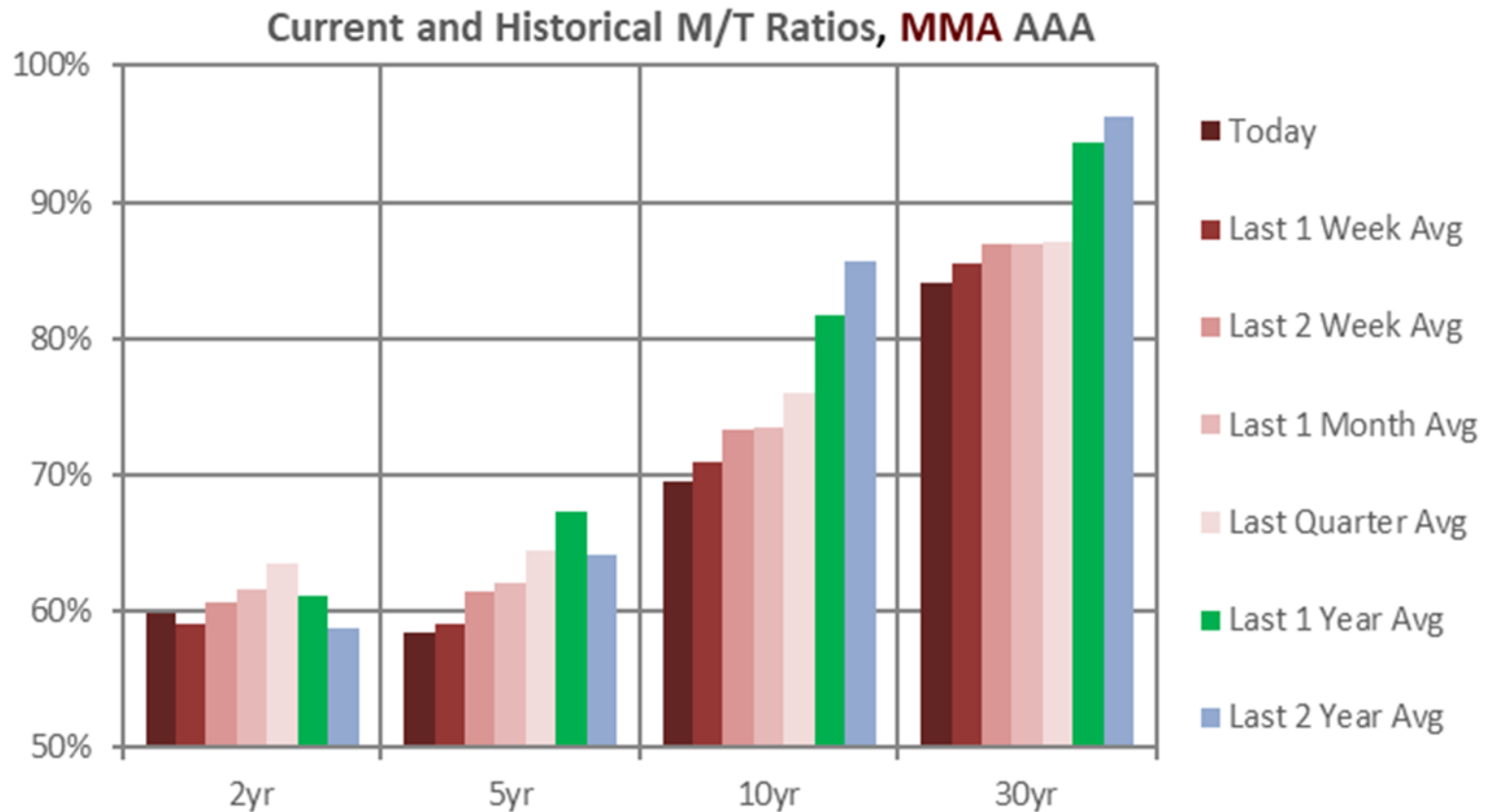
# Muni/Treasury Ratios

-Showing 5yr, 10yr and 30yr ratios for 2022-2023 vs. 3 month rolling averages



# Muni/UST Ratios – Longer Period Averages

-Showing select period ratios over the last two years.



# Seasonal Reinvestment

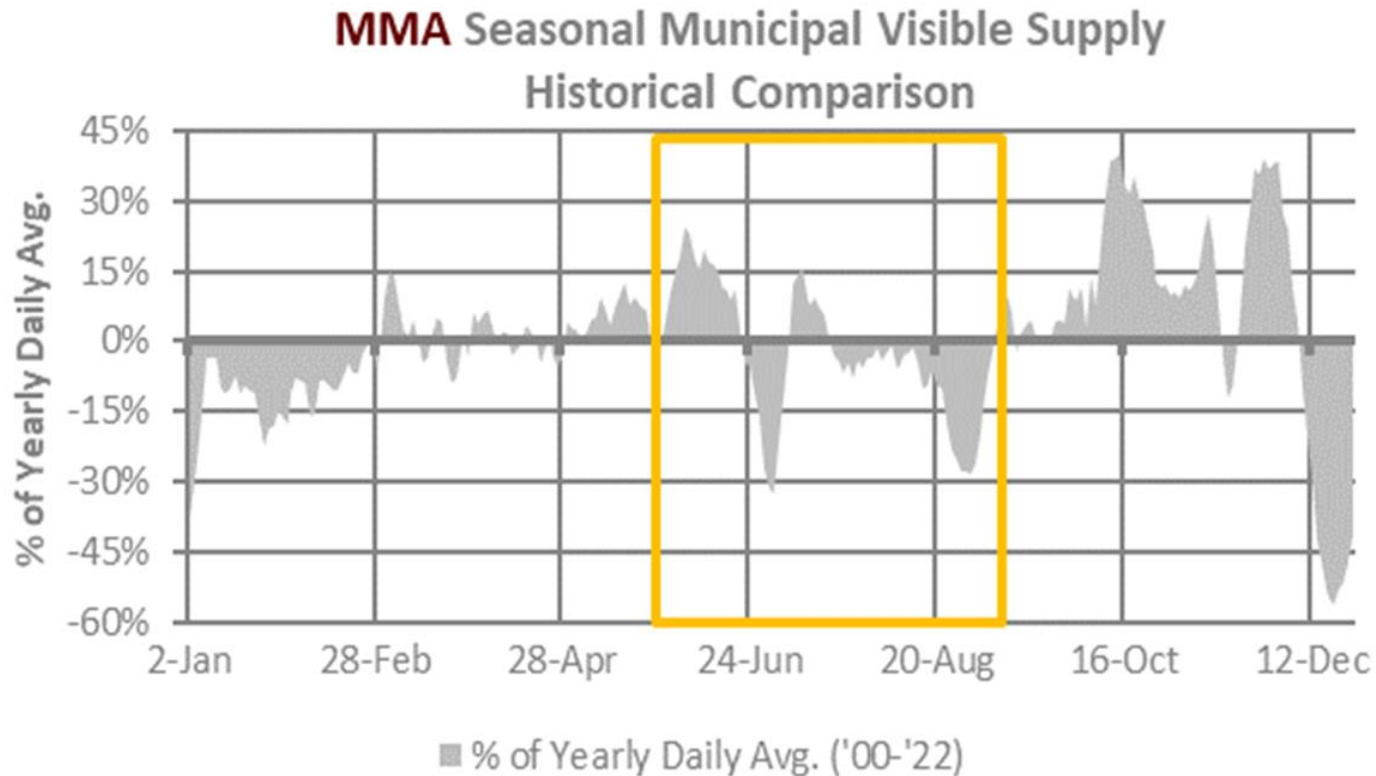
-Showing scheduled principal maturities and coupon payment

Scheduled Seasonal Reinvestment Demand:  
Maturities + Calls, \$B, Average from 2018-2022



# Seasonal Supply

-Showing average supply throughout the calendar year. Yellow box shows summer slowdown in primary issuance.



# Monthly Return Averages

-Showing average monthly municipal bond price return:

Average Monthly Municipal Bond Price Return  
of MMA's Index: 1990-2020



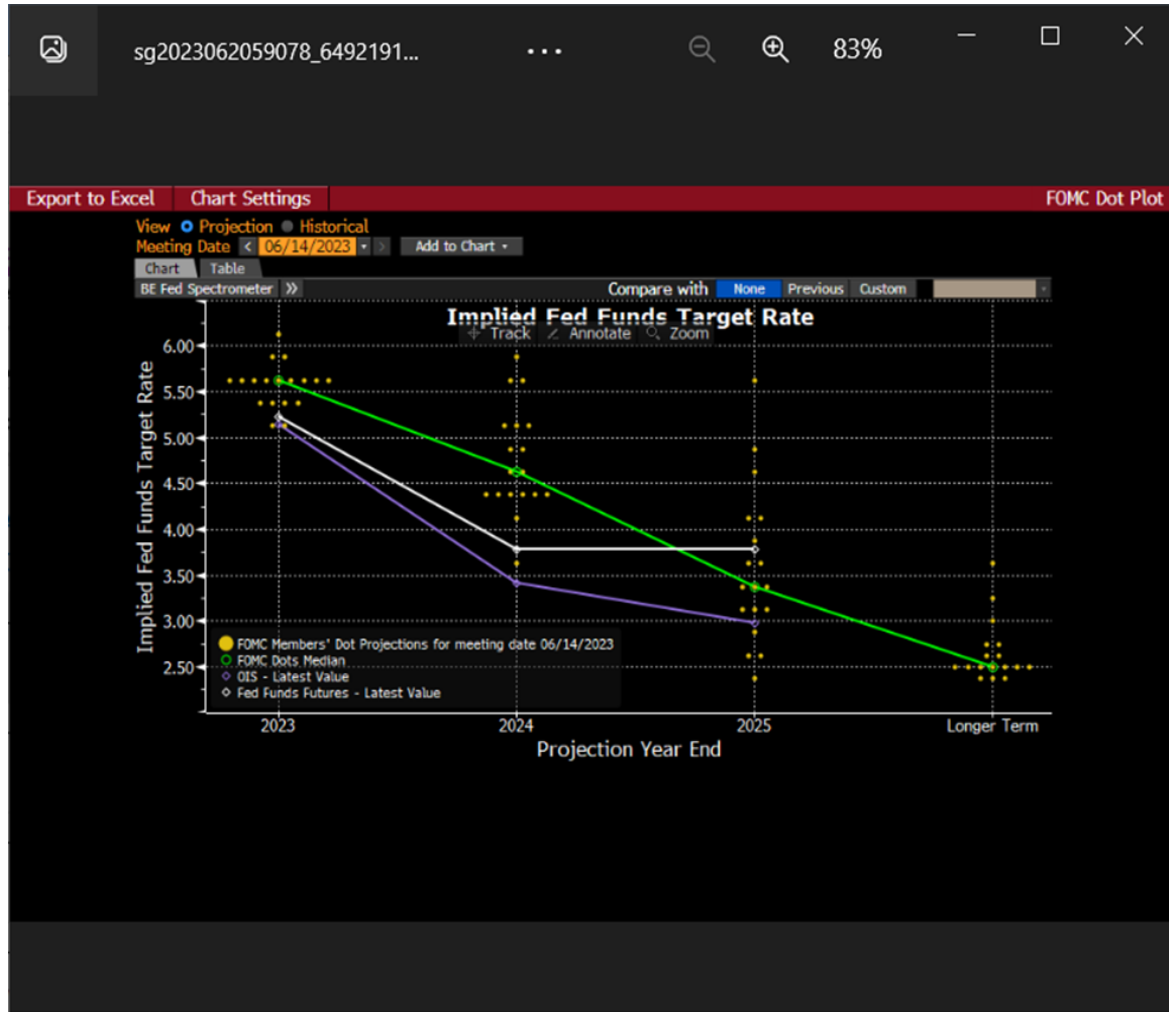


# Interest Rate & Yield Curve Analysis

# Interest Rate Probability: WIRP

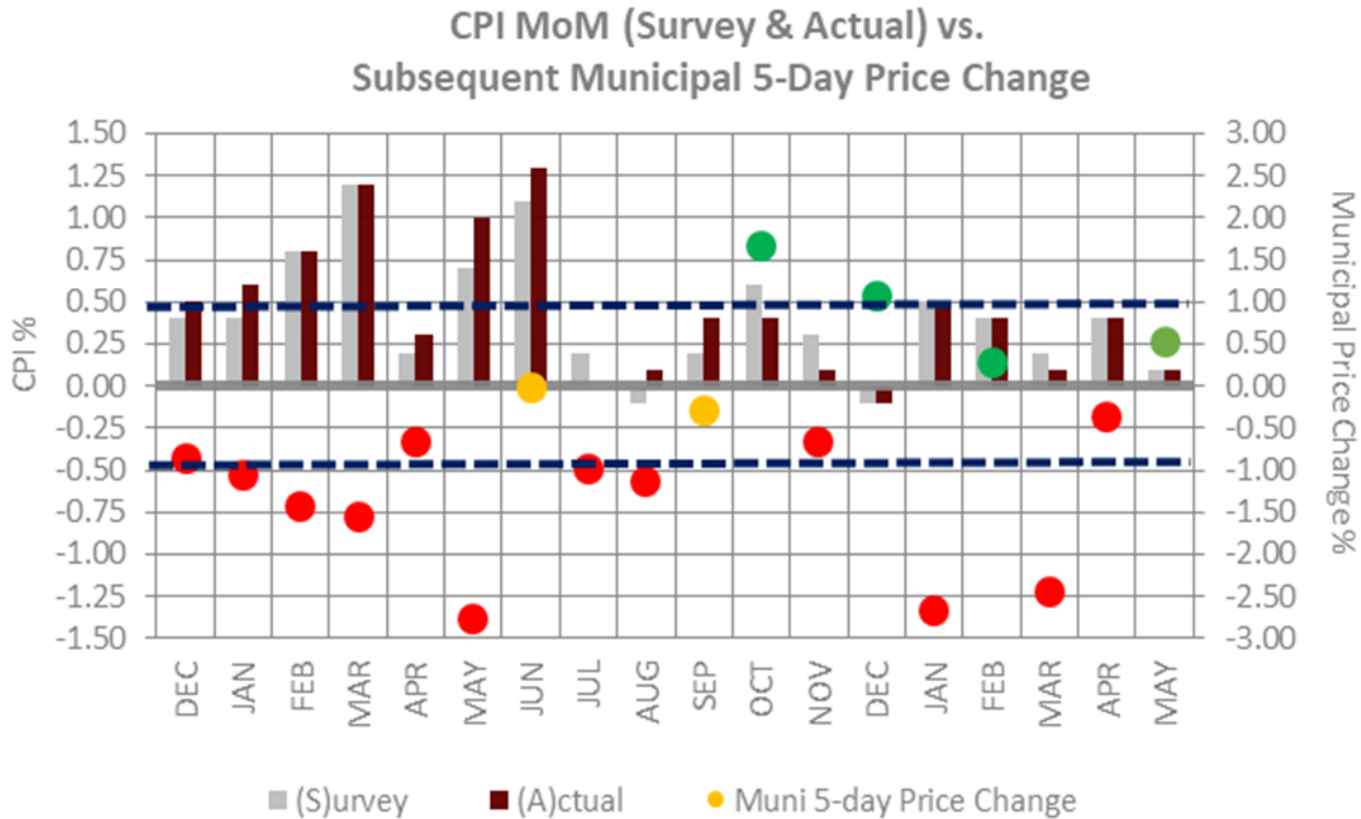


# FOMC Dot Plot: DOTS



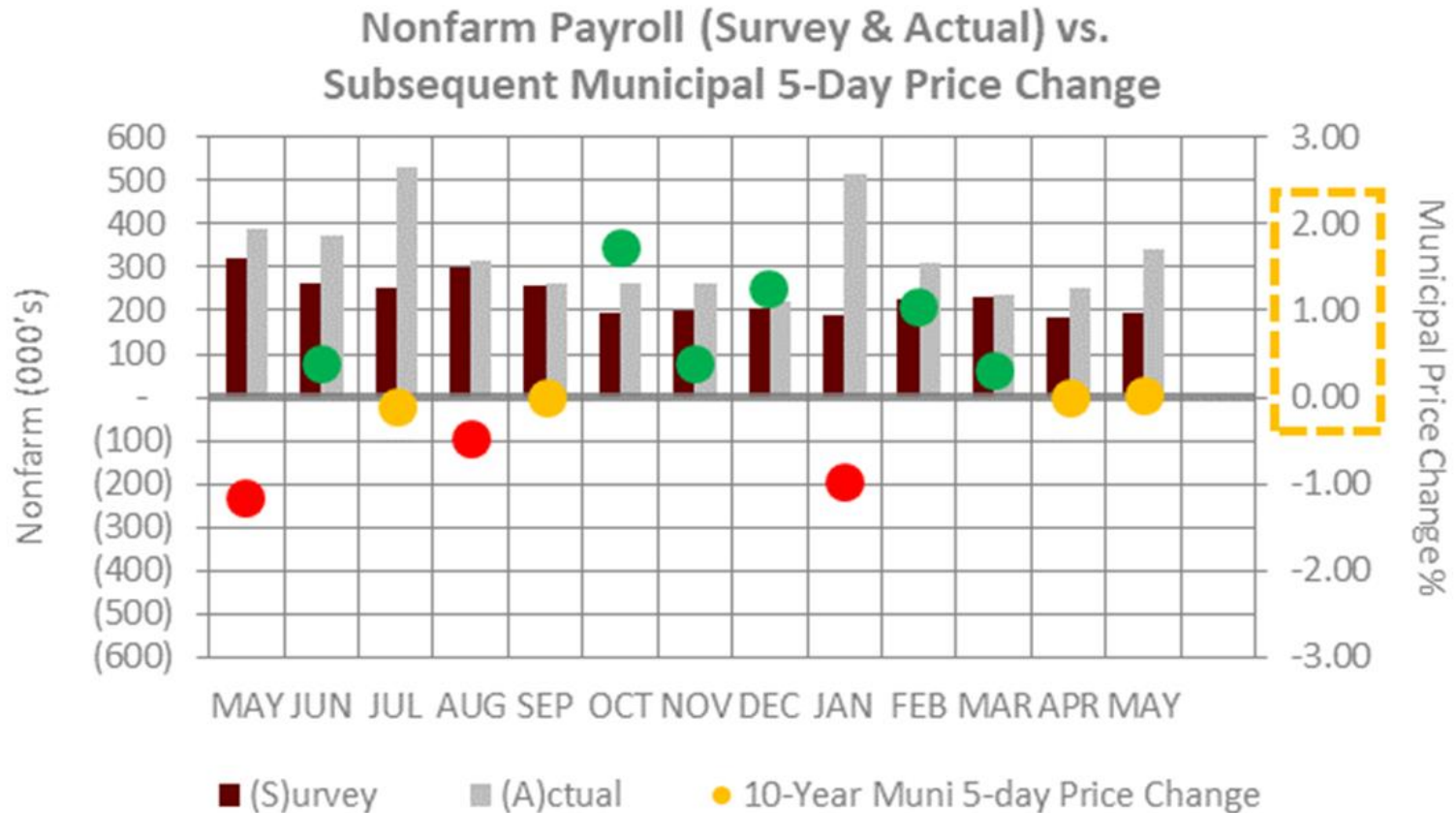
# Historical CPI and Muni Price Responses

-CPI a challenge for municipals. Data shows the period between 2022 – 2Q23



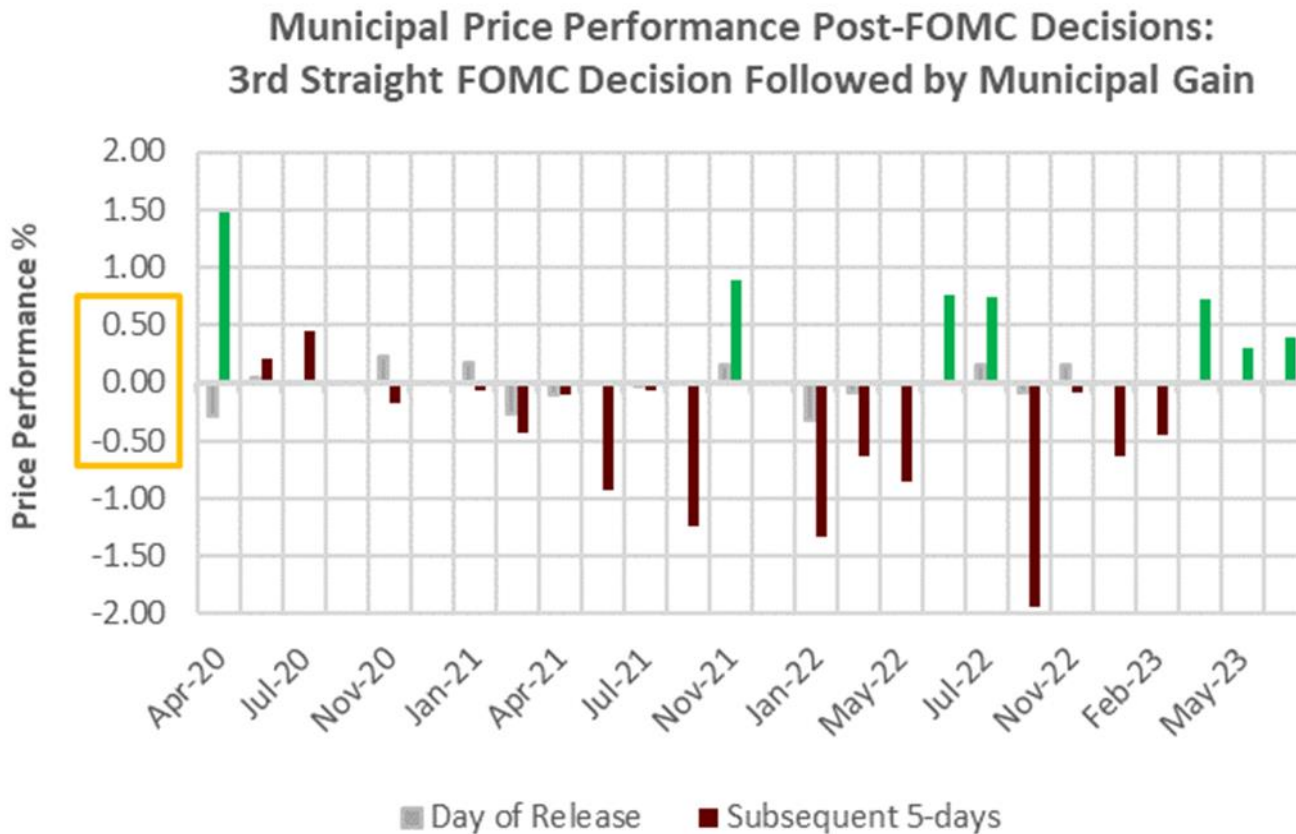
# Nonfarm Data and Price Responses

-Municipals have responded better to nonfarm



# Historical FOMC and Price Responses

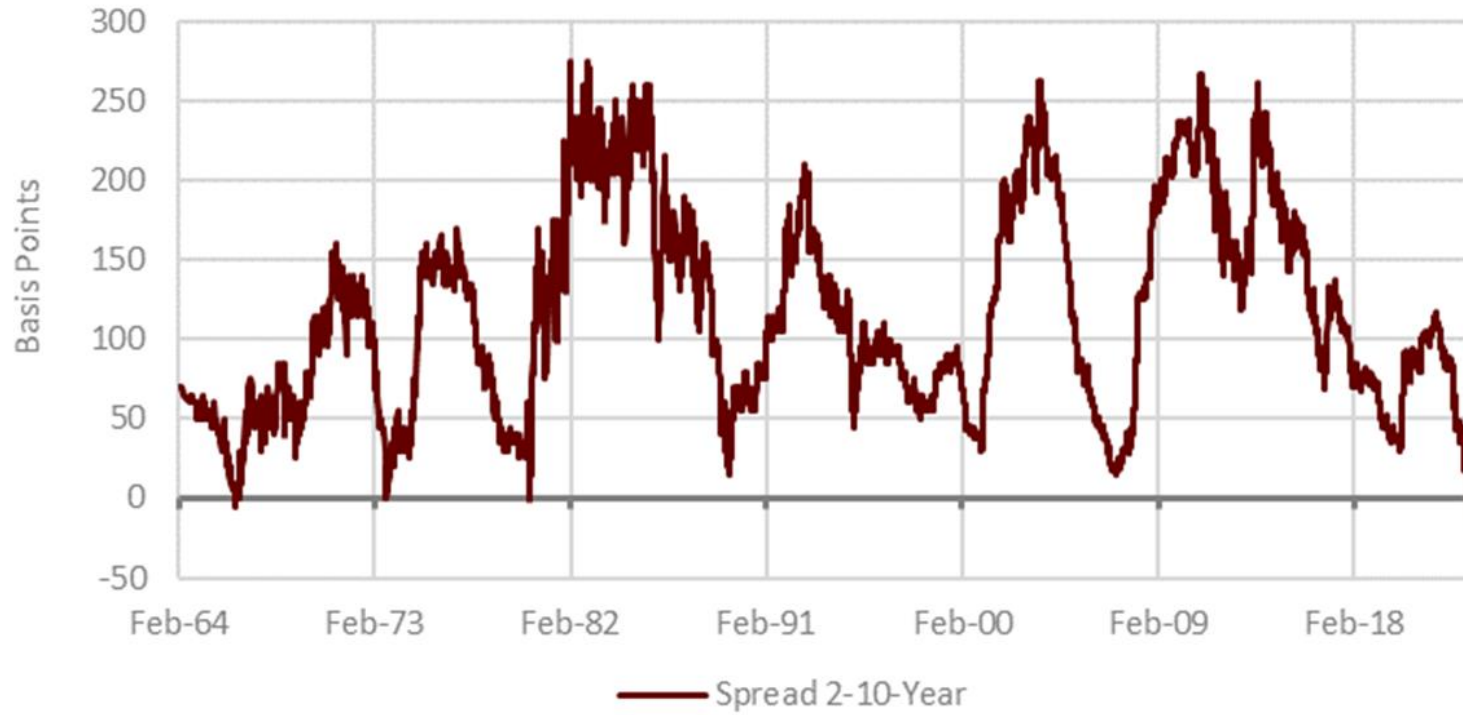
-Municipal returns the 5-days following FOMC meetings.



# Yield Curve Analysis

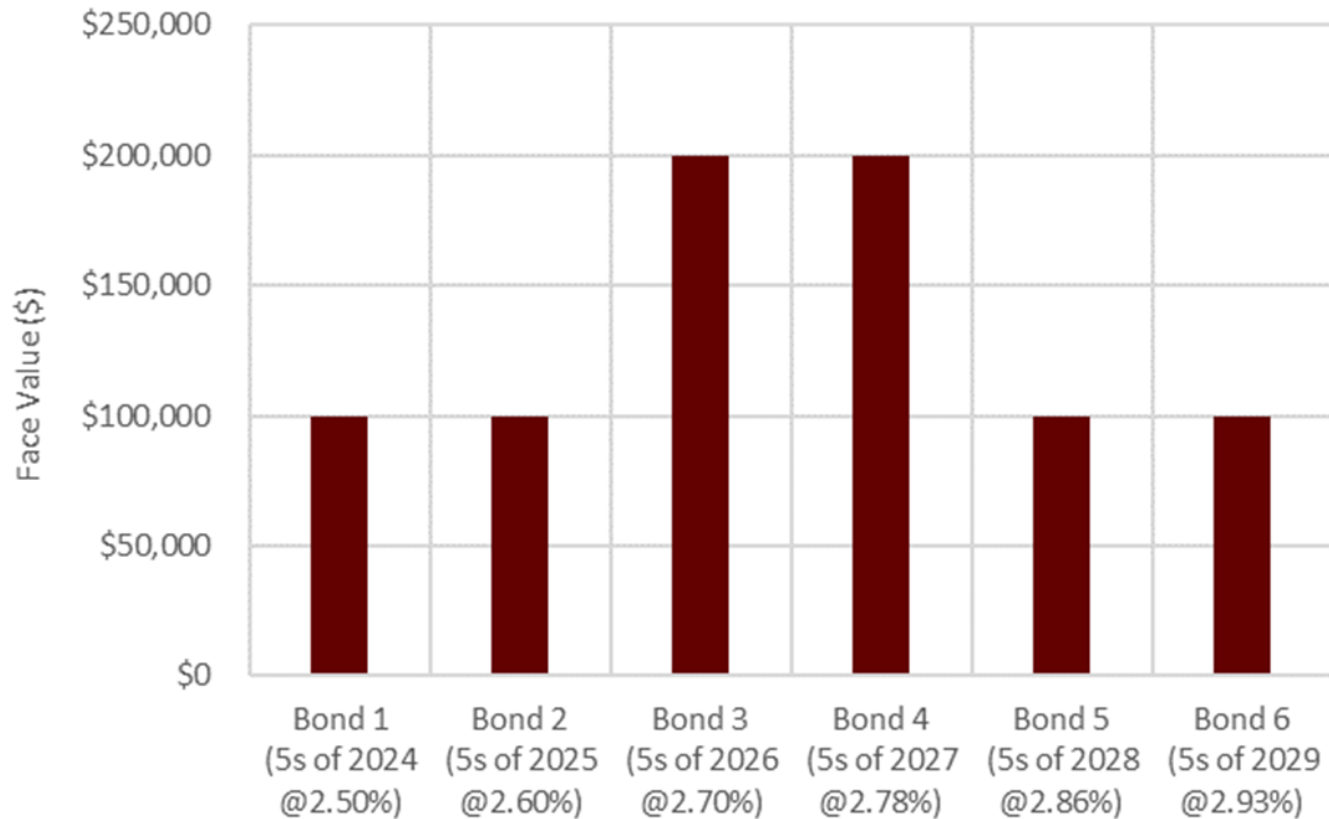
# Municipal Yield Curve Slope: 2s/10s

Municipal Yield Curve Slope 2 to 10 Years: 1964-2023:  
Curve in 2023 Inverted for the First Time Since September 1966

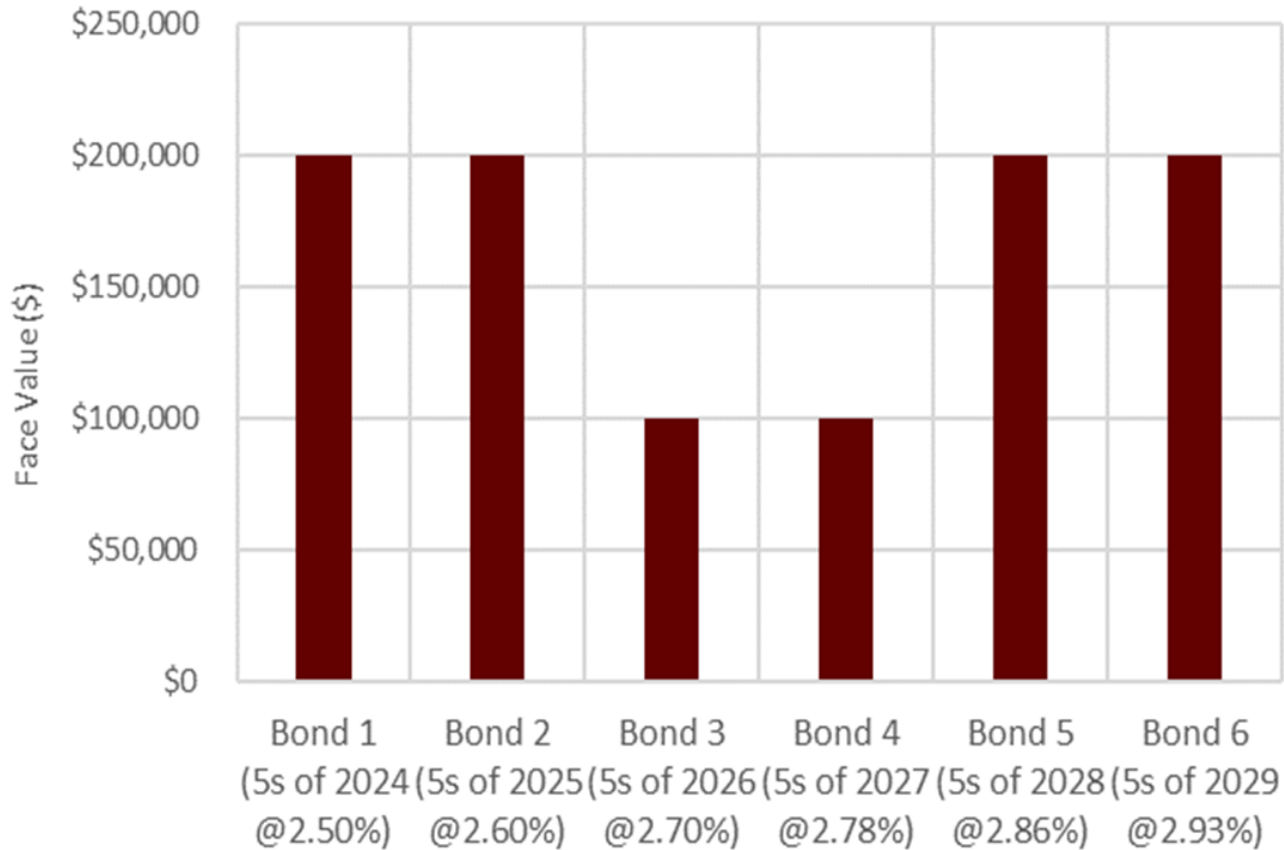




# Municipal Bond BULLET Portfolio Example



# Municipal Bond BARBELL Portfolio Example



# Key Rate Duration

- Measures the price sensitivity to changes in interest rates at particular points on the yield curve.
- As such, it is an improvement on duration because it takes into account non-parallel shifts in the yield curve.

# Convexity

## Convexity

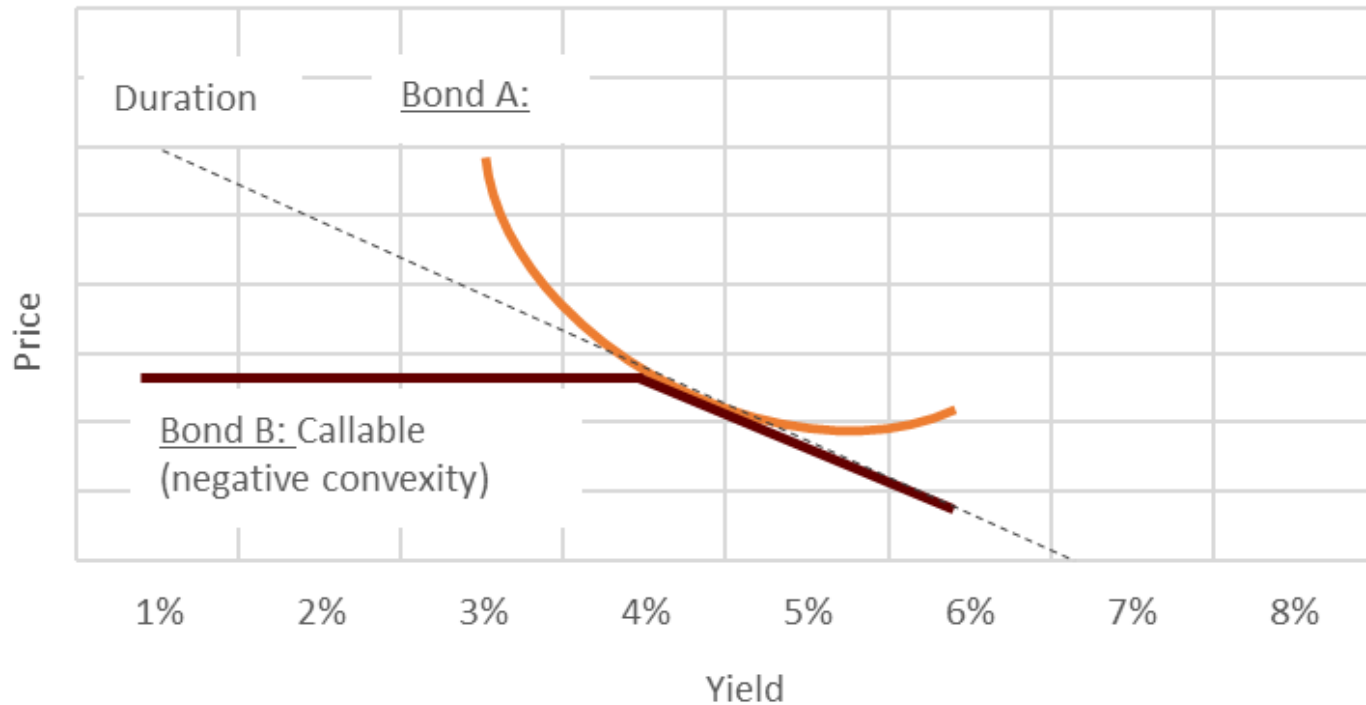
- Duration works for small changes in interest rates
- Convexity measures the sensitivity of a bond's duration to changes in yield.

## Things to know:

- Convexity is generally your friend!
- Negative convexity is ok if your being paid enough for it – may be useful in a stable i rate environment

# Convexity, Duration and Callable Bonds

Convexity And Callable Bonds



# Rolling Down Yield Curve

- If curve is steep, returns can at times be improved by selling a bond that has “rolled down the curve” and replacing it with a longer maturity bond.
- The price of the bond actually rises at certain points when it rolls down the curve (if held to maturity it will eventually decline to par)

Example: A 10 year maturity bond bought at par with a 3.0% yield held for one year in an environment where rates are steady and the curve is steep (20 basis points between 9 and 10 year maturities).

Sell the now 9 year bond at a 2.8% yield, price of xxx. Reinvest in 10 year maturity at par with a 3.0% yield.

- Risks: Curve can flatten, extending duration (back to original target).

# Risk Management

- Risk Framework
- Risk Modeling
- Regulatory Management
- Performance Attribution

# Risk Management: Framework & Modeling

## General Framework

- Rate risk
- Credit risk/Default risk
- Liquidity Risk

## Risk Modeling

-> total return/LDI/capital preservation vs. benchmark

- translate into a set of metrics
  - correlations (credits and rates)
  - volatility
  - alpha/tracking error targets
  - scenario analysis



# Regulatory Risk - Funds

- Derivatives Risk Management Program (Rule 18f4)
- Liquidity Risk Management (Rule 22e4)

# Performance Attribution Factor

- Duration
- Curve
- Income
- Sector
- Security

# Compliance

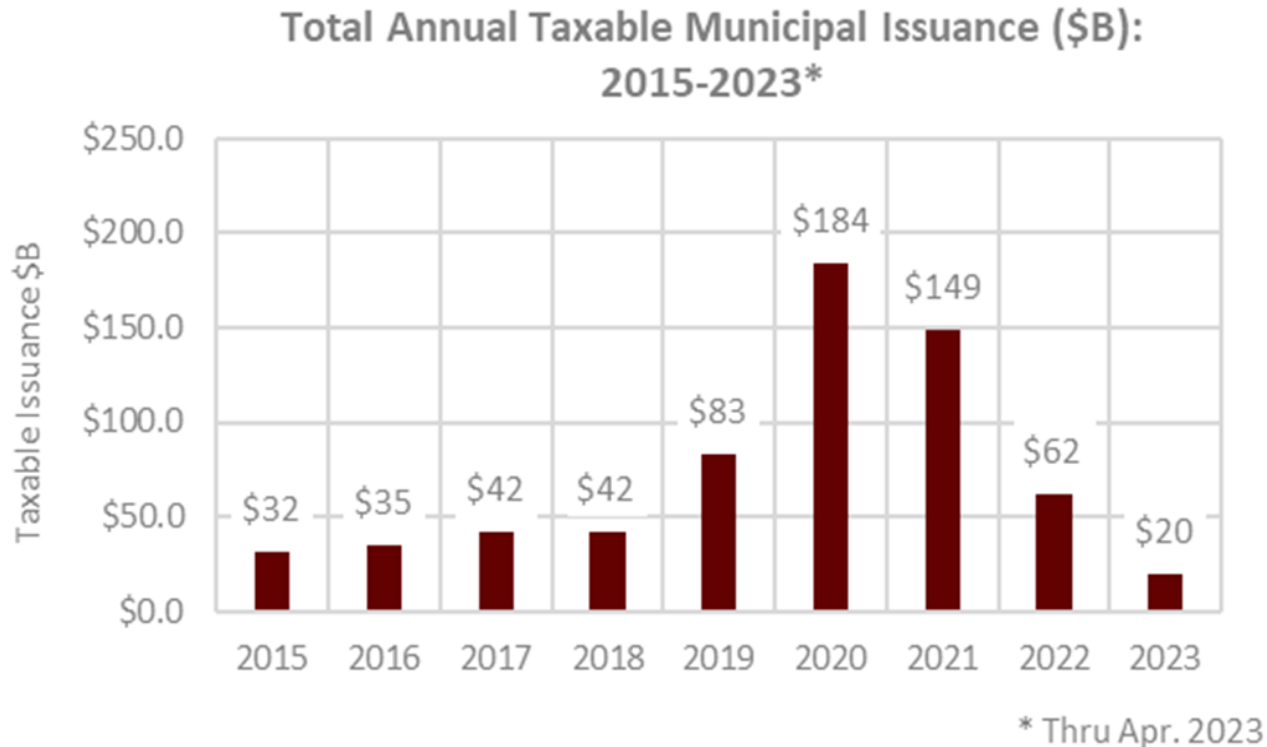
- Client Guidelines
- SEC Rules and Regulations
- State Regulations

# Client Communication

“Transparency builds trust.”

# Taxable Municipals

-Taxable municipal supply increased to ~20-30% of total in 2019 – 2021, but typically is closer to ~10-15% of total annual supply (or \$30 - \$50B/year).



# Conclusion

-Putting it all together

- Research
- Trading
- Relative Value Analysis
- Interest Rate/Yield Curve Analysis
- Risk Management
- Compliance