



# MAY 2024 CLIENT TRAINING

## BOND PRICING

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PFM Financial Advisors LLC

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# Thank you for joining us!

## *F r i e n d l y   R e m i n d e r s*

### ◆ This Session is Being Recorded

### ◆ Automatically Muted on Entry

- You are automatically muted when you join the call
- Please unmute yourself to participate
- Minimize Background Noise – re-mute when you are done speaking

### ◆ CPE Credits Available for This Session

- Attend this session in its entirety
- Answer all poll questions provided
- Survey must be completed

### ◆ Please Complete the Survey for This Session

### ◆ Send specific questions for me to [simmons@pfm.com](mailto:simmons@pfm.com)



- ◆ Opposing Objectives
- ◆ Scale Benchmarks
- ◆ PFM's Approach to Credit Spreads
- ◆ Structuring Considerations
- ◆ Competitive vs. Negotiated
- ◆ PFM's Pricing Process
- ◆ PFM's Post Pricing Analysis



# Opposing Objectives



## Poll Question 1:

◆ What are underwriters required to disclose to issuers prior to a Negotiated sale?

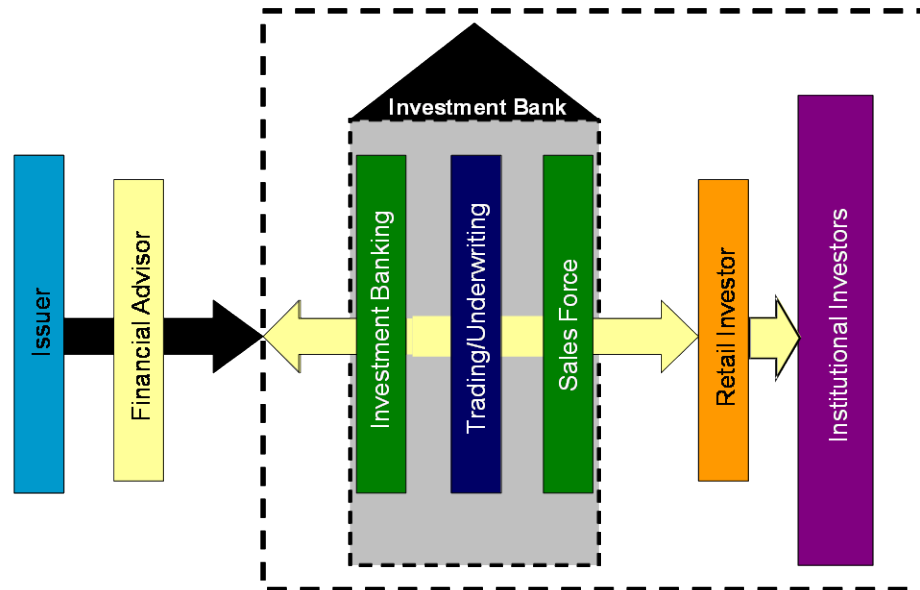
- A. Underwriters have a fiduciary duty to the Issuer.
- B. Underwriters are required by federal law to act in the best interest of the issuer
- C. The Underwriters have financial and other interests that differ from those of the Issuer



*The financial advisory industry is rooted in mitigating the inherent conflicts confronted by the investment banking industry*

## Issuer Objectives

- ✓ High Price/Low Interest Rate
- ✓ High Optionality
  - Callable
  - Couponing
- ✓ Optimal Security Structure/High Issuer Flexibility (Benefit vs. Cost)
  - Pledge
  - Covenants
  - Reserves
  - Insurance



## Investor Objectives

- ✓ Low Price/High Interest Rate
- ✓ Low Optionality
  - Non-Callable
  - Couponing
- ✓ Low Risk/Low Issuer Flexibility
  - Pledge
  - Covenants
  - Reserves
  - Insurance

*The effectiveness of a financial advisory firm is directly tied to its professional and technical resources and expertise*



# Investment Banks Represent Investors

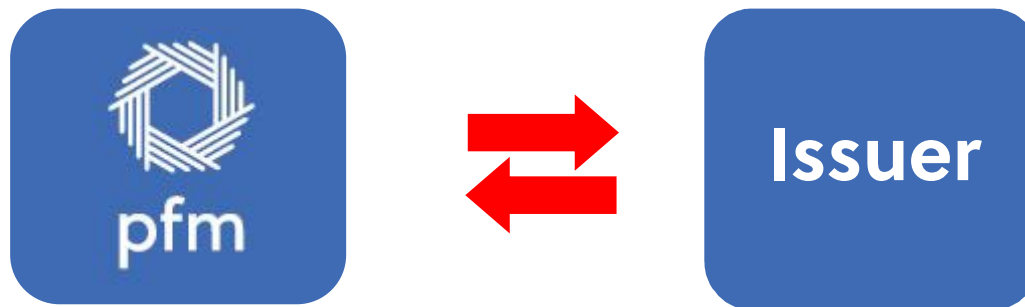
“The Underwriters **have financial and other interests that differ from those of the Issuer.**

Unlike a municipal advisor, the **Underwriters do not have a fiduciary duty to the Issuer** (or any other person or entity) under the federal securities laws and are, therefore, not required by federal law to act in the best interests of the Issuer or any other party without regard to their own financial or other interests.

The Underwriters **have a duty to purchase the Bonds from the Issuer at a fair and reasonable price, but must balance that duty with their duty to sell the Bonds to Investors at prices that are fair and reasonable.”**

- Typical underwriter disclosure statement provided to Issuer under new MA regulations.

- 
- PFM has a fiduciary duty to represent ***only the interests of the Issuer***





# Scale Benchmarks





## Poll Question 2:

◆ What are the characteristics of municipal Benchmarks?

- A. 5% Coupon
- B. 10 Year Par Call
- C. AAA
- D. All of the above



## ◆ **The “MMD Curve” historically has been the most widely used benchmark in the municipal market.**

- MMD Curve refers to the AAA-rated G.O. Curve
- Municipal market’s “risk-free” rate proxy
- MMD represents the current market rate for various maturities, assuming a 5% coupon and a 10-year par call
- MMD is produced by Refinitiv (TM3), an independent third-party market observer

## ◆ **The BVAL AAA Callable Curve offers an alternative benchmark that continues to gain interest from municipal market participants.**

- BVAL AAA Callable Curve refers to the AAA-rated G.O. Curve
- Municipal market’s “risk-free” rate proxy
- BVAL AAA Callable Curve represents the current market rate for various maturities, assuming a 5% coupon and a 10-year par call
- BVAL AAA Callable Curve is produced by Bloomberg, an independent third-party market observer



◆ The legacy curve does not offer the accessibility, transparency, objectivity, methodology, supporting data, or timeliness needed to meet the demands of today's market.

## ◆ BVAL AAA Callable Curve provides:

- **Accessibility:** publicly accessible to all on the MSRB's EMMA website:  
<https://emma.msrb.org/ToolsAndResources/BloombergYieldCurve?daily=True>
- **Transparency:** displays eligible trades and shows the movement from implied contributed sources
- **Objectivity:** use real-time trades and contributed sources to reflect movement in the Municipal market as it is happening. AAA curves are monitored on an hourly basis by BVAL's team of municipal evaluators
- **Methodology:** constructed using trades from the Municipal Securities Rulemaking Board (MSRB) and contributed data
- **Supporting Data:** trade data algorithmic based model with viewable observations that have been incorporated into the curve
- **Timeliness:** frequency of publication is dependable and predictable, produced hourly from 9am-4pm, and is also available on the MSRB's EMMA website
- **Adherence to IOSCO:** Creates an overarching framework of Principles for Benchmarks used in financial markets

## ◆ Additional attributes:

- **Constant maturity:** no monthly rolls
- **32 tenor points:** starting with a 3-month and 6-month tenor and every year from 1-30, allowing for better benchmarking inside 12 months



# Why Use a Benchmark?





- ◆ A method of measuring the value of a section of the bond market
- ◆ A tool used by issuers, investors and other financial professionals to describe the market, and to compare the rate of return on specific securities
- ◆ A tool that allows performance to be compared relative to a point in the market, accounting for differences in couponing, call feature, and credit.
- ◆ A metric that should track the same spot in the market, so that performance can be measured across time and different market environments



# **PFM's Approach to Credit Spreads**



### Poll Question 3:

What type of price on a bond will result when the Coupon is greater than the Yield?

- A. Premium Bond
- B. Discount Bond
- C. Par Bond
- D. None of the Above



# Traditional Approach to Credit Spreads: Re-offer Yield

## ISSUER PRICING ANALYSIS

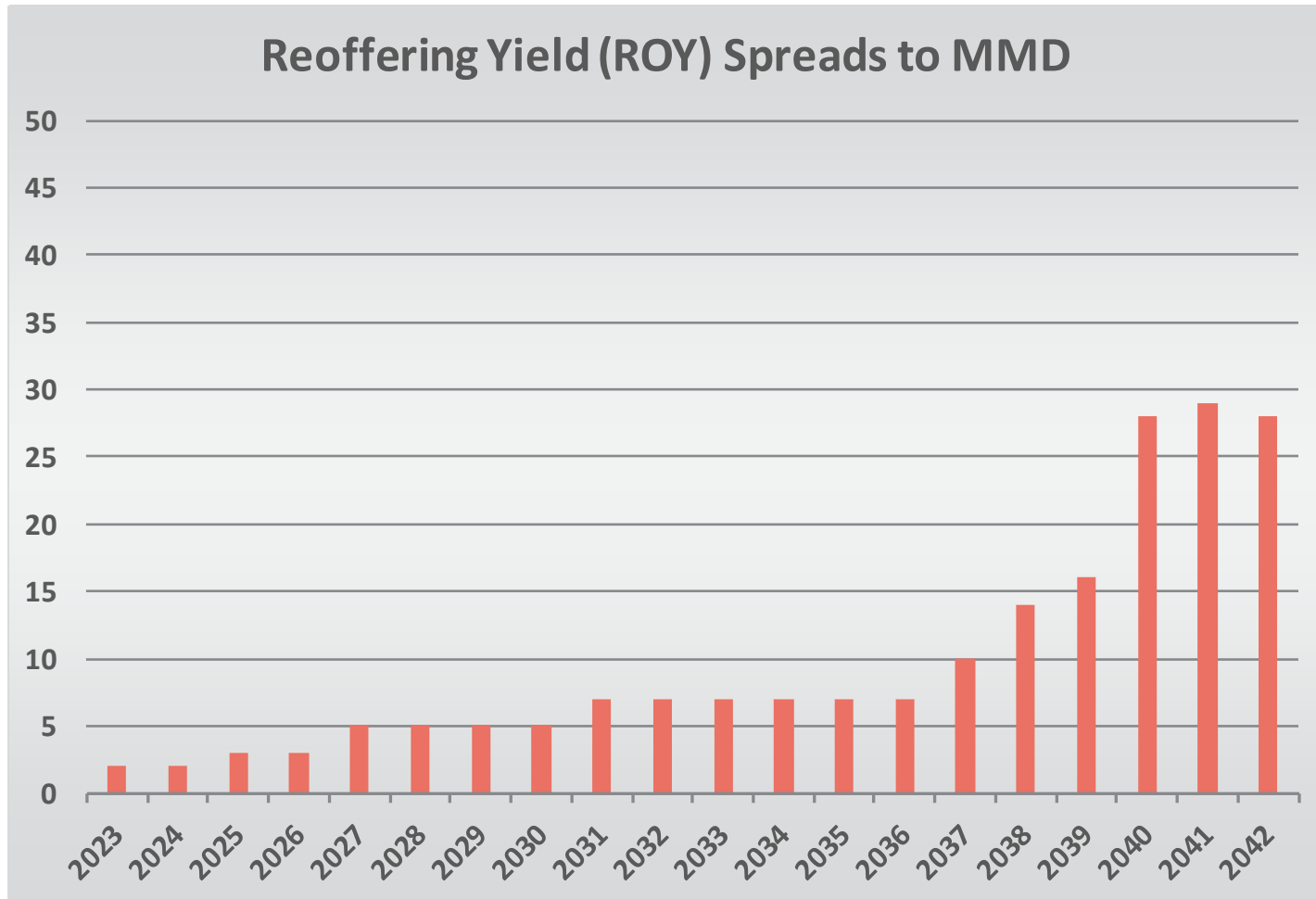
Series 2022

Maturity Date	Par Amount	Coupon	Reoffering Yield (ROY)	Yield To Maturity (YTM)	Non-Interpolated BVAL			Option Value Analysis		
					5% AAA G.O. Scale	ROY Spread	YTM Spread	OAY	Non-Call Scale	OAY Spread
6/1/23	15,000,000	2.000%	0.320%	0.320%	0.300%	<b>2 bps</b>	2 bps			
6/1/24	15,000,000	2.000%	0.580%	0.580%	0.560%	<b>2 bps</b>	2 bps			
6/1/25	15,000,000	3.000%	0.910%	0.910%	0.880%	<b>3 bps</b>	3 bps			
6/1/26	15,000,000	3.000%	1.260%	1.260%	1.230%	<b>3 bps</b>	3 bps			
6/1/27	15,000,000	3.000%	1.550%	1.550%	1.500%	<b>5 bps</b>	5 bps			
6/1/28	15,000,000	4.000%	1.880%	1.880%	1.830%	<b>5 bps</b>	5 bps			
6/1/29	15,000,000	4.000%	2.190%	2.190%	2.140%	<b>5 bps</b>	5 bps			
6/1/30	15,000,000	4.000%	2.490%	2.490%	2.440%	<b>5 bps</b>	5 bps			
6/1/31	15,000,000	4.000%	2.740%	2.740%	2.670%	<b>7 bps</b>	7 bps			
6/1/32	15,000,000	5.000%	2.920%	2.920%	2.850%	<b>7 bps</b>	7 bps			
6/1/33	15,000,000	5.000%	3.080%	3.217%	3.010%	<b>7 bps</b>	21 bps	3.183%	3.025%	16 bps
6/1/34	15,000,000	5.000%	3.250%	3.478%	3.180%	<b>7 bps</b>	30 bps	3.364%	3.205%	16 bps
6/1/35	15,000,000	5.000%	3.420%	3.704%	3.350%	<b>7 bps</b>	35 bps	3.518%	3.393%	13 bps
6/1/36	15,000,000	5.000%	3.570%	3.888%	3.500%	<b>7 bps</b>	39 bps	3.655%	3.551%	10 bps
6/1/37	15,000,000	5.000%	3.720%	4.051%	3.620%	<b>10 bps</b>	43 bps	3.789%	3.690%	10 bps
6/1/38	15,000,000	5.000%	3.870%	4.198%	3.730%	<b>14 bps</b>	47 bps	3.919%	3.818%	10 bps
6/1/39	15,000,000	5.000%	3.990%	4.311%	3.830%	<b>16 bps</b>	48 bps	4.018%	3.918%	10 bps
6/1/40	15,000,000	4.125%	4.205%	4.205%	3.930%	<b>28 bps</b>	28 bps	4.117%	4.018%	10 bps
6/1/41	15,000,000	4.250%	4.317%	4.317%	4.030%	<b>29 bps</b>	29 bps	4.216%	4.118%	10 bps
6/1/42	15,000,000	4.250%	4.411%	4.411%	4.130%	<b>28 bps</b>	28 bps	4.314%	4.218%	10 bps
Issuance Par:	300,000,000									
Average Life:	10.5 years									





# Traditional Approach to Credit Spreads





The traditional approach of gathering comparable Issuer's re-offer yields and the Issuer's historical re-offer yields to derive a spread to the MMD "AAA" doesn't allow for an apples-to-apples comparison for various coupon levels.

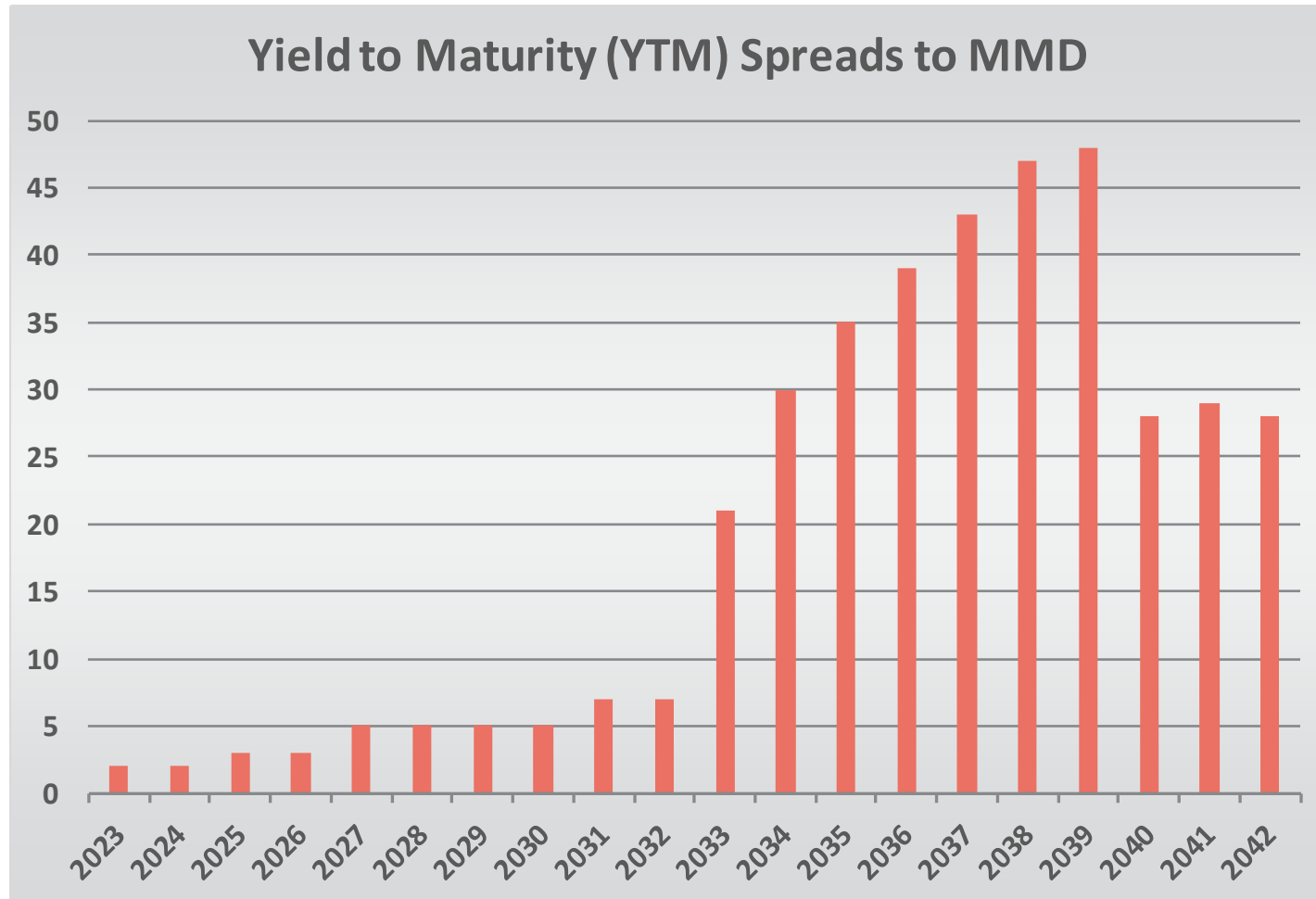


# Yield-to-Maturity (YTM) Approach to Credit Spreads

## ISSUER PRICING ANALYSIS

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Issuance Par:	300,000,000									
Average Life:	10.5 years									





The approach of gathering comparable Issuer's YTM and the Issuer's historical YTM to derive a spread to the MMD "AAA" fails to recognize the relative value of embedded call options at various coupon levels and call dates.



# Structuring Considerations



## Poll Question 4:

- ◆ Which coupon will result in the greatest amount of proceeds with the same amount of principal issued at the same stated yields?
- A. Zero Coupon
  - B. 3% Coupon
  - C. 4% Coupon
  - D. 5% Coupon



## ◆ Couponing

- Industry Standard 5% CPNs vs 4% CPNs vs Discount CPN (<\$100 \$\$ price)

## ◆ Call Feature

- Industry Standard 10 Year Par Call vs Shorter Call Features (<10 years)

## ◆ Both impact borrowing costs and optionality

- Lowest borrowing costs
  - Yield to Maturity (YTM)
  - Gross production
    - Par Amount vs Proceeds





Methods to measure the relative value of Coupon and Call Feature alternatives.

Option Adjusted Spread or Option Adjusted Yield analysis (OAS/OAY)

- Traditional measure
- Analysis used to assess relative value of various coupon and call date structures
- OAS does not take into account the difference in gross proceeds to the Issuer
- Investor metric



Discount Cash-flow Analysis

- Discounted Cash-flow Analysis takes into account gross proceeds and calculates all metrics on an NPV basis at the time of issuance
- Analysis that factors in gross production
- Issuer metric

Gross Proceeds		Bonds Issue
\$100M	@\$115	\$87M
\$100M	@\$97	\$103M
		\$16M



Coupon University					
Year	Term	5% Coupon	Spread to Benchmark	Lower Coupon	Spread to Benchmark
2038	14.7	5.000%	13 bps	4.000%	43 bps
2043	19.7	5.000%	18 bps	4.000%	58 bps
2053	29.7	5.000%	30 bps	4.125%	75 bps

- Price Discussions generally begin with spread talk
- Spread for 5% coupons vs lower coupons are obtained for comparison
- With that information, what should an Issuer sell?

- Lower Coupons have higher YTCs
- Lower Coupons have lower YTM
- How do you measure relative value between coupon structure?

Lower Coupon vs 5% Coupon					
Maturity	Call	Coupon	YTC	YTM	Price
2038	10yr	5.000%	3.180%	3.664%	115.072
	10yr	4.000%	3.480%	3.625%	104.242
			30 bps	-4 bps	\$10.83
2043	10yr	5.000%	3.450%	4.059%	112.671
	10yr	4.000%	3.850%	3.912%	101.199
			40 bps	-15 bps	\$11.47
2053	10yr	5.000%	3.780%	4.404%	109.817
	10yr	4.125%	4.350%	4.230%	98.228
			57 bps	-17 bps	\$11.59



# Traditional 10-Year Par Call or Shorter Calls

Coupon University					
Year	Term	10 Yr Call	Spread to Benchmark	5 Yr Call	Spread to Benchmark
2038	14.7	5.000%	13 bps	5.000%	-2 bps
2043	19.7	5.000%	18 bps	5.000%	3 bps
2053	29.7	5.000%	30 bps	5.000%	15 bps

- Standard call feature is a 10-year par call
- Standard 10-year par call spreads vs shorter call spreads are obtained for comparison
- With that information, what should an issuer sell?


- Shorter calls have lower Yield-to-Call
- Shorter calls have higher Yield-to-Maturity
- How do you measure relative value between call?

## 10 Year Par Call vs 5 Year Par Call

Maturity	Call	Coupon	YTC	YTM	Price
2038	10yr	5.000%	3.180%	3.664%	115.072
	5yr	5.000%	3.030%	4.213%	108.551
			-15 bps	55 bps	\$6.52
2043	10yr	5.000%	3.450%	4.059%	112.671
	5yr	5.000%	3.300%	4.438%	107.328
			-15 bps	38 bps	\$5.34
2053	10yr	5.000%	3.780%	4.404%	109.817
	5yr	5.000%	3.630%	4.635%	105.856
			-15 bps	23 bps	\$3.96



- This approach monetizes the trade-offs between YTC and YTM, as well as the difference in principal issued of various coupon structures
- Discounted Cash-flow Analysis expresses relative on an NPV basis – **Issuer Perspective**
- PFM's Discounted Cash-flow Analysis uses the issuer's current yield curve (borrowing costs), and calculates the yield curve shift where an issuer would be indifferent to better help make structural decisions

 <b>Issuer Maturity-by-Maturity Discounted Cash Flow Analysis</b> Savings (Loss) Under PFM Alt CPN / 9.8 yr PC Scale										
Maturity Date	Coupon	Original Par	Par Amount Reduction (Increase)	% Par Amount Reduction (Increase)	PV DS to Maturity Savings (Loss)	% PV DS to Maturity Savings (Loss)	PV Option Value Savings (Loss)	% PV Option Value Savings (Loss)	1 Current Refunding Savings (Loss)	Breakeven Yield Shift* (bps) PFM 5% CPN / 9.8 yr PC Scale PFM Alt CPN / 9.8 yr PC Scale
6/1/2038	5% vs 5.25%	\$3,070,000	\$66,115	2.2%	(\$10,956)	(0.3%)	\$15,361	15.9%	\$13,106	257 bps
6/1/2039	5% vs 5.25%	\$3,210,000	\$69,206	2.2%	(\$15,388)	(0.4%)	\$18,375	15.4%	\$13,573	250 bps
6/1/2040	5% vs 4%	\$3,380,000	(\$382,576)	(10.2%)	\$28,684	0.7%	(\$74,911)	(52.6%)	(\$121,010)	216 bps
6/1/2041	5% vs 4%	\$3,545,000	(\$401,711)	(10.2%)	\$48,033	1.1%	(\$85,115)	(52.9%)	(\$125,641)	208 bps
6/1/2042	5% vs 4%	\$3,725,000	(\$422,269)	(10.2%)	\$68,627	1.5%	(\$98,049)	(51.9%)	(\$131,433)	202 bps
6/1/2043	5% vs 5.25%	\$3,200,000	\$69,504	2.2%	(\$29,587)	(0.7%)	\$26,899	15.3%	\$12,909	223 bps
6/1/2044	5% vs 5.25%	\$3,370,000	\$73,196	2.2%	(\$34,691)	(0.8%)	\$30,320	15.3%	\$13,881	204 bps
6/1/2045	5% vs 5.25%	\$3,535,000	\$76,780	2.2%	(\$39,898)	(0.9%)	\$33,799	15.1%	\$14,828	186 bps
6/1/2046	5% vs 5.25%	\$3,715,000	\$80,690	2.2%	(\$45,421)	(1.0%)	\$37,466	15.4%	\$15,846	169 bps
6/1/2047	5% vs 5.25%	\$3,895,000	\$84,599	2.2%	(\$51,092)	(1.1%)	\$40,763	15.1%	\$16,835	155 bps
6/1/2048	5% vs 4.125%	\$3,060,000	(\$361,021)	(10.6%)	\$56,083	1.5%	(\$96,484)	(44.0%)	(\$155,213)	112 bps
6/1/2049	5% vs 4.125%	\$3,210,000	(\$378,718)	(10.6%)	\$69,306	1.8%	(\$105,663)	(43.6%)	(\$163,277)	99 bps
6/1/2050	5% vs 4.125%	\$3,340,000	(\$394,055)	(10.6%)	\$82,265	2.1%	(\$114,245)	(43.2%)	(\$170,099)	93 bps
6/1/2051	5% vs 4.125%	\$3,450,000	(\$407,033)	(10.6%)	\$95,097	2.4%	(\$122,168)	(42.9%)	(\$175,989)	85 bps
6/1/2052	5% vs 4.125%	\$3,625,000	(\$427,680)	(10.6%)	\$109,965	2.6%	(\$132,440)	(42.7%)	(\$185,038)	81 bps
<b>Savings (Loss)</b>			<b>(\$2,721,282)</b>		<b>\$345,446</b>		<b>(\$647,403)</b>		<b>(\$1,158,117)</b>	

PFM 5% CPN / 9.8 yr PC Scale REF Superior
PFM 5% CPN / 9.8 yr PC Scale MAT Superior
PFM Alt CPN / 9.8 yr PC Scale REF Superior
PFM Alt CPN / 9.8 yr PC Scale MAT Superior



# PFM's Pricing Process



## Poll Question 5:

◆ What Data can be used to help determine a fair clearing level for a primary issuance of municipal bonds?

- A. Secondary Trading Activity
- B. Primary Market Comparable transactions
- C. Issuer's prior primary market transactions
- D. All of the Above



- ◆ We enter every pricing with an independent opinion of where the issuer's bonds should price.
- ◆ We begin our pricing preparations a week or more before we receive the underwriters' target scales.
- ◆ We prepare an "Issuer Target Scale" prior to the pricing and distribute it to our client (and the bankers).
- ◆ We are proactive throughout the pricing by monitoring order flow, intra-day interest rate movements, and competing primary/secondary offerings.
- ◆ We conduct post-pricing analysis to demonstrate to our clients how well the financing priced on a relative basis and what, if any, improvements and/or corrective actions are required for the next sale.



Pricing Group Assistance Bond Pricing Timeline					
Days before the Sale Date	Activity	Party Responsible	Days before the Sale Date	Activity	Party Responsible
At earliest known time	-Provide projected sale date for issues in the next 60 days	Project Manager (PM)	1-2 Business Days	-Develop couponing and term bond strategies	PG/PM
	-Create tentative calendar of upcoming pricings	Pricing Group (PG)		-Assess current market conditions	PG
10 Business Days	-Confirm sale date	PM		-Establish target scale	PG
	-Send completed Bond Pricing Group Term Sheet to Pricing Group	PM		-Communicate pricing expectations to the senior manager	PG
	-Provide deal info (sale date(s), par amt., final maturity, syndicate, etc.)	PM		-Negotiate retail and/or institutional scales	PG
5 Business Days	-Find appropriate recent comparables	PG/PM		Day(s) of Pricing	-Monitor sale
	-Run OAS historical pricing analyses	PG	-Monitor orders		PG
	-Run OAS comparable pricing analyses	PG	-Monitor market		PG
	-Provide POS, Rating Agency write-ups, DBC #'s, etc	PM	-Negotiate and agree to final pricing with the underwriter		PG
3-4 Business Days	-Produce trade data reports	PG	Post-pricing	-Prepare post-sale analysis	PM
	-Discuss electronic order entry set-up with underwriter	PM		-Request secondary trading analysis from Pricing Group	PM
	-Develop pricing call schedule and circulate to the Pricing Group	PM		-Run Trade Evaluator model	PG





- 1) Analyze the client's pricing history relative to market benchmarks**
- 2) Analyze how comparable primary market deals are pricing relative to market benchmarks**
- 3) Analyze how comparable secondary market trades are pricing relative to market benchmarks**
- 4) Consider state-and sector-specific trading ranges**
- 5) Adjust/interpolate credit spreads for the maturity date(s) of the current issuance**
- 6) Create an initial target scale**
- 7) Share target scale and pricing worksheet with client (and banking team) prior to pricing**



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# Client Historical Pricing Analysis

Issuer: Mass AAA Water Deal											Series: Series 2021			
Security: Water & Sewer/Revenue														
Tax Status/Sale Type: Tax Exempt (Negotiated)														
Underwriter: Morgan Stanley														
Financial Advisor: PFM Fin Advisors														
Par Amount (Avg Life): 209,495,000 (11.8 years)														
Sale Date / Dated Date: 4/29/2021														
Last Call Date (Call Tenor): 02/01/2031 @ 100 (9.9 Yrs)														
Underlying Ratings (M/SP/F): Aaa/AAA/AAA														
Insured Ratings (M/SP/F): -/-														
Maturity Year (TSY)	Maturity	Maturity	Bond	Ins	Par	Coupon	ROY	Price	YTC	YTM	BVAL AAA MUNICIPAL CURVE			
	Date	Tenor	Type		Amount						Scale	ROY Spread	YTC Spread	YTM Spread
<1														
1	2/1/2022	0.8	Serial		7,635,000	5.000%	0.080%	\$103.550	0.080%	0.082%	0.080%	-	-	-
2	2/1/2023	1.8	Serial		7,065,000	5.000%	0.090%	\$108.450	0.090%	0.089%	0.090%	-	-	-
3	2/1/2024	2.8	Serial		7,390,000	5.000%	0.170%	\$113.110	0.170%	0.171%	0.170%	-	-	-
4	2/1/2025	3.8	Serial		7,740,000	5.000%	0.300%	\$117.380	0.300%	0.301%	0.290%	1 bps	1 bps	1 bps
5	2/1/2026	4.8	Serial		8,105,000	5.000%	0.420%	\$121.390	0.420%	0.420%	0.410%	1 bps	1 bps	1 bps
6	2/1/2027	5.8	Serial		8,315,000	5.000%	0.550%	\$125.030	0.550%	0.550%	0.530%	2 bps	2 bps	2 bps
7	2/1/2028	6.9	Serial		8,710,000	5.000%	0.700%	\$128.190	0.700%	0.700%	0.670%	3 bps	3 bps	3 bps
8	2/1/2029	7.9	Serial		9,130,000	5.000%	0.840%	\$131.040	0.840%	0.840%	0.800%	4 bps	4 bps	4 bps
9	2/1/2030	8.9	Serial		9,565,000	5.000%	0.950%	\$133.820	0.950%	0.950%	0.910%	4 bps	4 bps	4 bps
10	2/1/2031	9.9	Serial		10,020,000	5.000%	1.030%	\$136.640	1.030%	1.030%	0.980%	5 bps	5 bps	5 bps
11	2/1/2032	10.9	Serial		10,085,000	5.000%	1.120%	\$135.640	1.120%	1.407%	1.050%	7 bps	7 bps	36 bps
12	2/1/2033	11.9	Serial		10,565,000	5.000%	1.170%	\$135.100	1.170%	1.687%	1.090%	8 bps	8 bps	60 bps
13	2/1/2034	12.9	Serial		11,075,000	5.000%	1.220%	\$134.550	1.220%	1.925%	1.120%	10 bps	10 bps	81 bps
14	2/1/2035	14.0	Serial		11,605,000	5.000%	1.260%	\$134.120	1.260%	2.121%	1.160%	10 bps	10 bps	96 bps
15	2/1/2036	15.0	Serial		12,170,000	5.000%	1.300%	\$133.690	1.300%	2.291%	1.200%	10 bps	10 bps	109 bps
16	2/1/2037	16.0	Serial		12,760,000	5.000%	1.350%	\$133.150	1.350%	2.447%	1.240%	11 bps	11 bps	121 bps
17	2/1/2038	17.0	Serial		13,380,000	5.000%	1.400%	\$132.610	1.400%	2.585%	1.280%	12 bps	12 bps	131 bps
18	2/1/2039	18.0	Serial		14,030,000	5.000%	1.440%	\$132.190	1.440%	2.702%	1.320%	12 bps	12 bps	138 bps
19	2/1/2040	19.0	Serial		14,715,000	5.000%	1.480%	\$131.760	1.480%	2.807%	1.360%	12 bps	12 bps	145 bps
20	2/1/2041	20.1	Serial		15,435,000	5.000%	1.520%	\$131.340	1.520%	2.902%	1.400%	12 bps	12 bps	150 bps



# Comparable Transaction Analysis

Issuer:	New Mexico AAA Water Deal						New York AAA Water Deal					Wisconsin AAA Water Deal					Virginia AAA Water Deal													
Series:	Senior Lien Public Project Revolving Fund Revenue Bonds, Series 2022						Revolving Funds Revenue Bonds, Series 2022 (Green Bonds)					Environmental Improvement Fund Revenue Bonds, Series 2022 (Green Bonds)					Infrastructure Revenue Bonds, Series 2022 (Virginia Pooled Financing Program)													
Security:	Gen Purpose/Pub Impt/Revenue						Gen Purpose/Pub Impt/Revenue					Water & Sewer/Revenue					Gen Purpose/Pub Impt/Revenue													
Sale Type:	Tax Exempt (Negotiated)						Tax Exempt (Negotiated)					Tax Exempt (Competitive)					Tax Exempt (Negotiated)													
Underwriter:	JPMorgan						Jefferies					Morgan Stanley					Raymond James													
Financial Advisor:	PFM Fin Advisors						PFM Fin Advisors; Independent Pub Adv					PFM Fin Advisors					Other FA													
Par Amount:	\$67,500,000						\$326,775,000					\$50,000,000					\$39,175,000													
Sale Date:	11/3/2022						11/1/2022					10/25/2022					10/25/2022													
Last Call Date:	6/1/2032 @ 100 (9.7Yrs)						9/15/2032 @ 100 (10Yrs)					6/1/2032 @ 100 (9.7Yrs)					11/1/2032 @ 100 (10.2Yrs)													
Underlying Ratings:	Aa1/AAA/-						Aaa/AAA/AAA					-/AAA/AAA					Aaa/AAA/-													
Insured Ratings:	-/-						-/-					-/-					-/-													
Maturity Year (TSY)	Par (M)	Price	Coupon	Yield	BVAL	SPRD	Par (M)	Price	Coupon	Yield	BVAL	SPRD	Par (M)	Price	Coupon	Yield	BVAL	SPRD	Par (M)	Price	Coupon	Yield	BVAL	SPRD						
<1																														
1	700	\$100.95	5.000%	3.090%		2 bps	Mar 1,410 \$100.53 5.000% 3.010% -3 bps																	565 \$101.72 5.000% 3.160% 1 bps						
2	5,000	\$102.65	5.000%	3.180%		2 bps	Sep 5,645 \$101.45 5.000% 3.080% 4 bps						2,835 \$102.68 5.000% 3.200% 3 bps						810 \$103.37 5.000% 3.210% 3 bps											
3	3,500	\$104.25	5.000%	3.220%		3 bps	Mar 1,635 \$102.29 5.000% 3.150% 0 bps						2,970 \$104.23 5.000% 3.250% 5 bps						855 \$104.90 5.000% 3.250% 5 bps											
4	3,000	\$105.72	5.000%	3.260%		5 bps	Sep 5,420 \$103.15 5.000% 3.160% 1 bps						3,125 \$105.63 5.000% 3.300% 6 bps						895 \$106.26 5.000% 3.300% 6 bps											
5	3,500	\$107.15	5.000%	3.280%		6 bps	Mar 1,715 \$103.96 5.000% 3.180% 0 bps						3,275 \$107.07 5.000% 3.310% 7 bps						935 \$107.67 5.000% 3.310% 7 bps											
6	3,800	\$108.44	5.000%	3.310%		7 bps	Sep 5,565 \$104.79 5.000% 3.180% 0 bps						3,445 \$108.28 5.000% 3.350% 7 bps						990 \$108.56 5.000% 3.400% 11 bps											
7	3,900	\$109.57	5.000%	3.350%		9 bps	Mar 1,810 \$105.45 5.000% 3.230% 3 bps						3,615 \$109.31 5.000% 3.400% 10 bps						1,040 \$109.64 5.000% 3.430% 12 bps											
8	4,200	\$110.59	5.000%	3.390%		11 bps	Sep 5,725 \$106.24 5.000% 3.230% 3 bps						3,790 \$110.21 5.000% 3.450% 13 bps						1,090 \$110.63 5.000% 3.460% 13 bps											
9	4,800	\$111.73	5.000%	3.400%		11 bps	Mar 1,900 \$107.01 5.000% 3.230% 3 bps						3,980 \$110.99 5.000% 3.500% 15 bps						1,145 \$111.37 5.000% 3.510% 13 bps											
10	3,500	\$112.21	5.000%	3.480%		13 bps	Sep 5,885 \$107.77 5.000% 3.230% 3 bps						4,180 \$111.56 5.000% 3.560% 15 bps						1,210 \$111.89 5.000% 3.570% 15 bps											
11	3,500	\$111.35	5.000%	3.580%		17 bps	Mar 2,000 \$108.21 5.000% 3.290% 7 bps						1,320 \$110.79 5.000% 3.650% 18 bps						1,265 \$110.92 5.000% 3.680% 18 bps											
12	3,200	\$110.00	5.000%	3.740%		21 bps	Sep 6,050 \$108.92 5.000% 3.290% 7 bps						1,390 \$109.53 5.000% 3.800% 21 bps						1,340 \$109.52 5.000% 3.840% 24 bps											
13	3,300	\$109.33	5.000%	3.820%		24 bps	Mar 2,105 \$109.32 5.000% 3.340% 10 bps						1,460 \$109.11 5.000% 3.850% 23 bps						1,410 \$108.66 5.000% 3.940% 31 bps											
14	3,200	\$108.83	5.000%	3.880%		27 bps	Sep 6,220 \$109.99 5.000% 3.340% 10 bps						1,530 \$108.61 5.000% 3.910% 26 bps						1,485 \$108.32 5.000% 3.980% 33 bps											
15	3,200	\$108.25	5.000%	3.950%		30 bps	Mar 2,205 \$110.57 5.000% 3.350% 10 bps						1,610 \$108.28 5.000% 3.950% 28 bps						1,565 \$108.06 5.000% 4.010% 34 bps											
16	3,100	\$107.60	5.000%	4.030%		36 bps	Sep 6,395 \$111.13 5.000% 3.360% 11 bps						1,685 \$107.86 5.000% 4.000% 31 bps						1,635 \$107.72 5.000% 4.050% 36 bps											
17	3,100	\$106.94	5.000%	4.110%		40 bps	Mar 2,310 \$111.68 5.000% 3.370% 10 bps						1,770 \$107.45 5.000% 4.050% 32 bps						1,730 \$107.30 5.000% 4.100% 37 bps											
18	3,000	\$106.22	5.000%	4.200%		41 bps	Sep 6,570 \$112.13 5.000% 3.390% 12 bps						1,865 \$106.88 5.000% 4.120% 33 bps						1,885 \$99.37 4.500% 4.550% 71 bps											
19	3,000	\$105.81	5.000%	4.250%		41 bps	Mar 2,435 \$112.21 5.000% 3.450% 13 bps						1,950 \$106.48 5.000% 4.170% 33 bps						850 \$105.54 5.000% 4.310% 45 bps											
20	3,000	\$105.65	5.000%	4.270%		41 bps	Sep 6,760 \$112.67 5.000% 3.460% 14 bps						2,050 \$106.23 5.000% 4.200% 34 bps						7,635 \$106.29 5.250% 4.460% 47 bps											
25							Mar 2,540 \$111.97 5.000% 3.540% 16 bps												5,905 \$97.65 4.750% 4.900% 86 bps											
30							Sep 6,950 \$111.71 5.000% 3.570% 19 bps																							
35	590	\$108.80	5.000%	3.900%		42 bps	Mar 2,650 \$110.58 5.000% 3.700% 20 bps																							
							Sep 7,135 \$110.49 5.000% 3.710% 21 bps																							
							Mar 2,775 \$109.72 5.000% 3.800% 25 bps																							
							Sep 7,320 \$109.63 5.000% 3.810% 26 bps																							
							10,410 \$109.12 5.000% 3.870% 28 bps																							
							10,715 \$108.61 5.000% 3.930% 30 bps																							
							11,030 \$108.19 5.000% 3.980% 33 bps																							
							11,335 \$107.77 5.000% 4.030% 34 bps																							
							11,660 \$107.02 5.000% 4.120% 35 bps																							
							11,770 \$106.52 5.000% 4.180% 36 bps																							
							12,080 \$106.35 5.000% 4.200% 36 bps																							
							64,475 \$104.64 5.000% 4.410% 42 bps																							
							74,170 \$106.28 5.250% 4.450% 39 bps																							



- 1) Analyze the client's pricing history relative to market benchmarks
- 2) Analyze how comparable primary market deals are pricing relative to market benchmarks
- 3) Analyze how comparable secondary market trades are pricing relative to market benchmarks**
- 4) Consider state-and sector-specific trading ranges**
- 5) Adjust/interpolate credit spreads for the maturity date(s) of the current issuance
- 6) Create an initial target scale
- 7) Share target scale and pricing worksheet with client (and banking team) prior to pricing



# Secondary Trade Analysis

## Recent High Grade Water Trades

Maturity	Issuer	State	Sector	Underlying	Insurer	Tax Status	Trade Date	Par Amount	Price	Coupon	Yield	Spread to BVA	Call Tenor
2026	Texas Water Development Board	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/09/22	\$1,250,000	105.68	5.00%	3.23%	9 bps	Non-Call
2026	Texas Water Development Board	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/09/22	\$1,250,000	105.65	5.00%	3.24%	10 bps	Non-Call
2026	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$5,000,000	106.00	5.00%	3.22%	6 bps	Non-Call
2026	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$5,000,000	105.98	5.00%	3.22%	6 bps	Non-Call
2026	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/07/22	\$1,355,000	92.49	2.00%	4.09%	90 bps	Non-Call
2027	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$1,500,000	107.56	5.00%	3.26%	9 bps	Non-Call
2027	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$1,500,000	107.55	5.00%	3.26%	9 bps	Non-Call
2027	Trinity River Authority of Texas	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$3,805,000	107.47	5.00%	3.28%	11 bps	Non-Call
2030	New York State Environmental Facilitie	NY	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/10/22	\$1,750,000	113.04	5.00%	3.06%	0 bps	Non-Call
2030	New York State Environmental Facilitie	NY	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/10/22	\$1,750,000	112.84	5.00%	3.09%	3 bps	Non-Call
2031	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/10/22	\$1,265,000	113.21	5.00%	3.23%	15 bps	7.7Yrs
2031	The Metropolitan Water District of Sou	CA	Water & Sewer	Aa1/AAV-		Tax Exempt	11/08/22	\$1,000,000	114.25	5.00%	3.15%	-11 bps	Non-Call
2031	Texas Water Development Board	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$4,985,000	103.08	4.00%	3.55%	29 bps	8.1Yrs
2031	Texas Water Development Board	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$4,985,000	103.06	4.00%	3.55%	30 bps	8.1Yrs
2032	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$1,185,000	111.09	5.00%	3.42%	13 bps	8.2Yrs
2032	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$1,165,000	110.89	5.00%	3.45%	16 bps	8.2Yrs
2033	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$1,950,000	109.99	5.00%	3.64%	26 bps	8.7Yrs
2033	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$1,950,000	110.00	5.00%	3.64%	26 bps	8.7Yrs
2033	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$1,460,000	111.65	5.00%	3.57%	18 bps	9.9Yrs
2033	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$1,460,000	111.64	5.00%	3.57%	18 bps	9.9Yrs
2034	Iowa Finance Authority	IA	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,100,000	108.76	5.00%	3.69%	21 bps	7.8Yrs
2034	Iowa Finance Authority	IA	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,100,000	108.71	5.00%	3.69%	22 bps	7.8Yrs
2034	City of Cincinnati (OH)	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/08/22	\$1,495,000	110.43	5.00%	3.64%	14 bps	9.2Yrs
2034	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/08/22	\$1,770,000	87.26	3.00%	4.37%	87 bps	7.2Yrs
2034	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/08/22	\$1,770,000	87.18	3.00%	4.38%	88 bps	7.2Yrs
2034	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/08/22	\$1,100,000	107.83	5.00%	3.73%	23 bps	7.2Yrs
2034	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/08/22	\$1,100,000	107.78	5.00%	3.74%	23 bps	7.2Yrs
2034	City of Cincinnati (OH)	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/09/22	\$1,495,000	110.81	5.00%	3.59%	11 bps	9.2Yrs
2037	Gilbert Water Resources Municipal Pro	AZ	Water & Sewer	-/AAA/AAA		Tax Exempt	11/09/22	\$2,300,000	109.29	5.00%	3.84%	20 bps	9.8Yrs
2037	Gilbert Water Resources Municipal Pro	AZ	Water & Sewer	-/AAA/AAA		Tax Exempt	11/09/22	\$3,000,000	109.29	5.00%	3.84%	20 bps	9.8Yrs
2037	Western Municipal Water District Facil	CA	Water & Sewer	-/AA+/AAA		Tax Exempt	11/09/22	\$2,795,000	109.17	5.00%	3.65%	0 bps	8.0Yrs
2037	Western Municipal Water District Facil	CA	Water & Sewer	-/AA+/AAA		Tax Exempt	11/09/22	\$2,795,000	108.98	5.00%	3.68%	3 bps	8.0Yrs
2037	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/10/22	\$3,470,000	99.22	4.00%	4.07%	58 bps	8.2Yrs
2038	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/08/22	\$1,170,000	108.66	5.00%	3.92%	23 bps	9.9Yrs
2038	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/09/22	\$1,170,000	109.92	5.00%	3.77%	9 bps	9.9Yrs
2039	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$2,110,000	106.26	5.00%	4.20%	48 bps	9.7Yrs
2039	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/08/22	\$2,110,000	106.02	5.00%	4.23%	51 bps	9.7Yrs
2039	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,880,000	109.95	5.00%	3.76%	4 bps	9.8Yrs
2039	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,880,000	109.95	5.00%	3.76%	4 bps	9.8Yrs
2040	New York State Environmental Facilitie	NY	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/09/22	\$2,575,000	93.62	4.00%	4.53%	79 bps	9.7Yrs
2040	New York State Environmental Facilitie	NY	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/09/22	\$2,575,000	93.58	4.00%	4.53%	79 bps	9.7Yrs
2040	New York City Municipal Water Financ	NY	Water & Sewer	Aa1/AA+/AA+		Tax Exempt	11/10/22	\$1,100,000	104.89	5.00%	4.20%	62 bps	7.2Yrs
2040	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/07/22	\$1,735,000	109.19	5.00%	3.85%	6 bps	9.8Yrs
2040	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/07/22	\$1,735,000	109.09	5.00%	3.86%	8 bps	9.8Yrs
2040	Texas Water Development Board (TX)	TX	Water & Sewer	-/AAA/AAA		Tax Exempt	11/10/22	\$1,700,000	102.80	4.65%	4.30%	71 bps	10.1Yrs
2041	Massachusetts Clean Water Trust (M/	MA	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/09/22	\$1,650,000	107.61	5.00%	3.91%	14 bps	8.4Yrs
2041	Massachusetts Clean Water Trust (M/	MA	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/09/22	\$1,650,000	107.36	5.00%	3.94%	18 bps	8.4Yrs
2041	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,795,000	108.77	5.00%	3.90%	10 bps	9.8Yrs
2041	City of Charlotte	NC	Water & Sewer	Aaa/AAA/AAA		Tax Exempt	11/08/22	\$1,795,000	108.77	5.00%	3.90%	10 bps	9.8Yrs
2044	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/10/22	\$2,450,000	105.33	5.00%	4.12%	40 bps	7.2Yrs
2044	Ohio Water Development Authority	OH	Water & Sewer	Aaa/AAV-		Tax Exempt	11/10/22	\$2,450,000	105.32	5.00%	4.12%	40 bps	7.2Yrs



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Mass AAA Water Deal (Aaa/AAA/AAA) - SERIES 2022 Pricing Worksheet									
pfm		PFM 5% CPN / 9.2 yr PC Scale							Spread to 11/28/2022 Interpolat ed BVAL
Year	Term	Avg Life	Principal	Coupon	ROY	YTC	YTM	Price	
2/1/2024	1.1		\$ 18,640,000	5.000%	2.63%			102.619	-1 bps
2/1/2025	2.1		\$ 20,940,000	5.000%	2.68%			104.770	-1 bps
2/1/2026	3.1		\$ 21,645,000	5.000%	2.72%			106.794	-1 bps
2/1/2027	4.1		\$ 22,385,000	5.000%	2.77%			108.644	-1 bps
2/1/2028	5.1		\$ 22,070,000	5.000%	2.79%			110.493	1 bps
2/1/2029	6.1		\$ 22,745,000	5.000%	2.84%			112.071	3 bps
2/1/2030	7.1		\$ 23,540,000	5.000%	2.85%			113.781	5 bps
2/1/2031	8.1		\$ 24,370,000	5.000%	2.88%			115.266	5 bps
2/1/2032	9.1		\$ 25,010,000	5.000%	2.90%			116.736	5 bps
2/1/2033	10.1		\$ 25,910,000	5.000%	2.94%		3.10%	116.387	5 bps
2/1/2034	11.1		\$ 14,050,000	5.000%	3.09%		3.36%	115.090	8 bps
2/1/2035	12.1		\$ 14,525,000	5.000%	3.22%		3.57%	113.980	10 bps
2/1/2036	13.1		\$ 15,010,000	5.000%	3.35%		3.75%	112.883	13 bps
2/1/2037	14.1		\$ 15,530,000	5.000%	3.42%		3.86%	112.297	16 bps
2/1/2038	15.1		\$ 16,070,000	5.000%	3.48%		3.96%	111.798	17 bps
2/1/2039	16.1		\$ 16,540,000	5.000%	3.50%		4.01%	111.632	17 bps
2/1/2040	17.1		\$ 17,135,000	5.000%	3.53%		4.07%	111.384	19 bps
2/1/2041	18.1		\$ 17,755,000	5.000%	3.59%		4.14%	110.890	19 bps
2/1/2042	19.1		\$ 18,400,000	5.000%	3.61%		4.18%	110.726	19 bps
2/1/2043	20.1		\$ 19,075,000	5.000%	3.64%		4.22%	110.480	20 bps

Total Par \$391,345,000  
 Avg Life 10.1 years  
 PV01 \$ 262,467

Call Date:  
 2/1/2032





- 1) Analyze the client's pricing history relative to market benchmarks
- 2) Analyze how comparable primary market deals are pricing relative to market benchmarks
- 3) Analyze how comparable secondary market trades are pricing relative to market benchmarks
- 4) Consider state-and sector-specific trading ranges
- 5) Adjust/interpolate credit spreads for the maturity date(s) of the current issuance
- 6) Create an initial target scale
- 7) Share target scale and pricing worksheet with client (and banking team) prior to pricing**



## Mass AAA Water Deal Series 2022 Order Analysis

### Quick Statistics

• Series Overview

• Account Overview

# Maturities: 50  
Issuance Par: \$391,345

#Accounts 37  
Total Priority Orders: 409

% Subscription: 353.65%

Total Orders: \$1,384M  
# Full Orders: 99

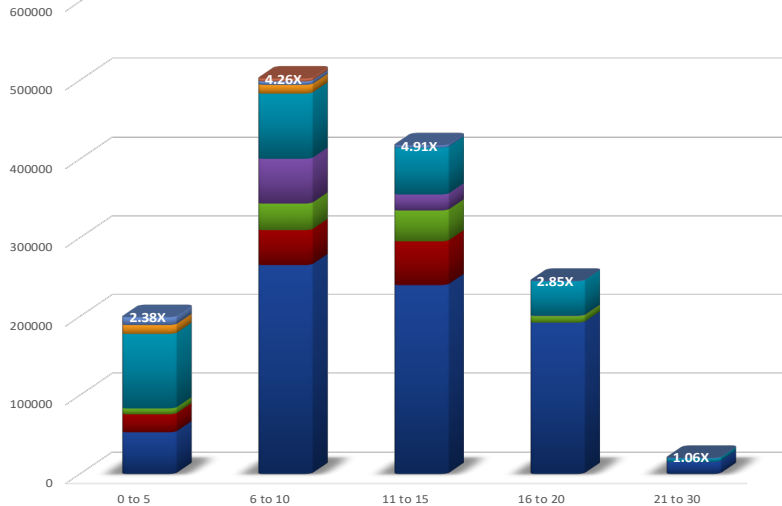
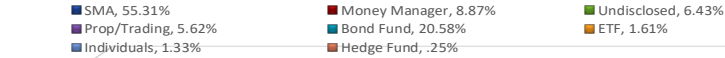
• Order Overview

• Order Statistics

### Top 10 Investors

Account	Type	Order Count	Full Orders	Total Orders	%Par	% Total Orders
Gannett Welsh & Kotler	SMA	38	36	\$294,660	75.29%	21.29%
PNC Advisors	Money Manager	14	14	\$90,060	23.01%	6.51%
Parametric Portfolio Associates, Inc.	Undisclosed	18	12	\$88,995	22.74%	6.43%
Nuveen Asset Management, LLC	SMA	15	6	\$83,670	21.38%	6.05%
Breckinridge Capital Advisors, Inc.	SMA	14	4	\$79,620	20.35%	5.75%
Bessemmer Trust Company N.A.	SMA	19	0	\$78,420	20.04%	5.67%
16th Amendment Advisors LLC	Prop/Trading	28	0	\$77,820	19.89%	5.62%
UBS Global Asset Management	SMA	13	5	\$70,235	17.95%	5.07%
Goldman Sachs Asset Management	Bond Fund	12	9	\$63,915	16.33%	4.62%
Northern Trust	Bond Fund	12	2	\$55,630	14.22%	4.02%
<b>Top 10 Investors Total:</b>		<b>183</b>	<b>88</b>	<b>\$983,025</b>	<b>251.19%</b>	<b>71.03%</b>

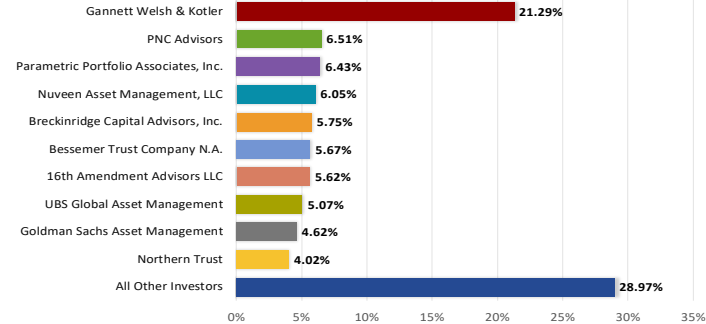
### Investor Type - Orders by Tenor Range



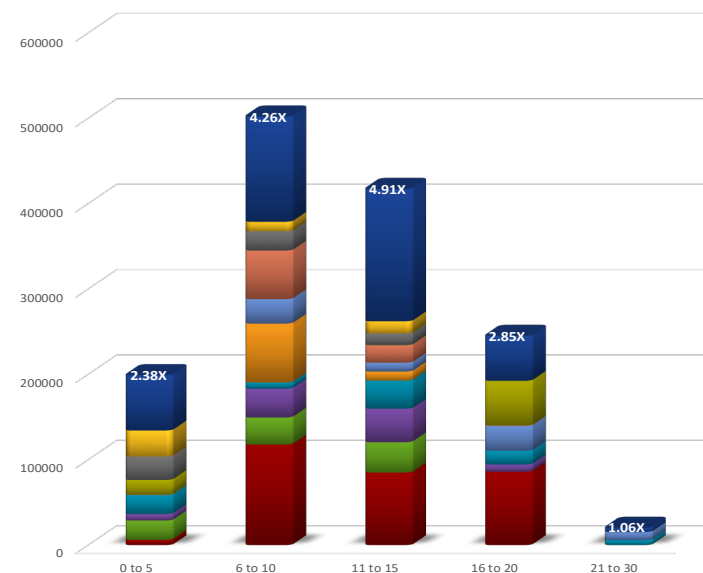
### Underwriter Overview - Top 5

Underwriter	# Orders	Total Priority	Institutional	Retail	Stock
BofA Securities, NY	342	\$1,368,935	\$521,590	\$847,345	
Citigroup Global	24	\$2,225		\$2,225	\$40,000
Ramirez & Co.	14	\$200		\$200	\$32,500
UBS Financial Svc	4				\$26,215
Raymond James & Asso	10	\$1,615		\$1,615	\$20,000
<b>Top 5 Underwriters Total:</b>	<b>394</b>	<b>\$1,372,975</b>	<b>\$521,590</b>	<b>\$851,385</b>	<b>\$118,715</b>

### Top 10 Accounts - % Of Total Orders



### Top 10 Accounts - Orders by Tenor Range





Mass AAA Water Deal Series 2022 Order Detail Analysis																					
Maturity Coupon	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	Totals
	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	
Par	18,640	20,940	21,645	22,385	22,070	22,745	23,540	24,370	25,010	25,910	14,050	14,525	15,010	15,530	16,070	16,540	17,135	17,755	18,400	19,075	391,345
Priority Orders	26,655	33,470	43,895	95,065	112,895	104,400	64,485	85,410	134,940	103,630	80,160	63,460	82,345	87,725	60,680	32,310	62,855	57,425	31,890	20,295	1,383,990
Subscription	143%	160%	203%	425%	512%	459%	274%	350%	540%	400%	571%	437%	549%	565%	378%	195%	367%	323%	173%	106%	354%
Gannett Welsh & Kotler		3000	3000		22070	22745	23540	24370	25010	25910	14050	14525	15010	15530	16070	16540	17135	17755	18400		294660
PNC Advisors	5245	5750	5860	5975	6095	6215	6345	6480	6625	6765	6920	7090	7255	7440							90060
Parametric Portfolio Associates, Inc.	55	30		7450	6930	7850	6080	6320	6580	6845	7130	7435	7755	10090	8445						88995
Nuveen Asset Management, LLC	5000	5500	5750	5500	5165	1000			1000				15010	17930	16070					5745	83670
Breckinridge Capital Advisors, Inc.					10315	22235		18050	18430		3500	7090									79620
Bessemer Trust Company N.A.			650		5160	6265	5560	5800	5900	8650	1750					2500	8565	8880	9200	9540	78420
16th Amendment Advisors LLC						14100	14650	14000	14200	13100	7000		100	100	210	155	80		50	75	77820
UBS Global Asset Management				17530									305				25735	26665			70235
Goldman Sachs Asset Management		5750	21645	200	6095	6215	700	3000	6625	6765	6920										63915
Northern Trust	9070	10130		11175	11040						7000	7215									55630
Cap Group				11195	11040	11375			12505												46115
Alliance Bernstein				15290																	44890
Eagle Asset Management, Inc.								6480	6625	6765	6920			7440	7625	12815	9340				41855
INSIGHT INVESTMENT MANAGEMENT									12600	12950	7100										32650
Blackrock Financial Management SMA	2685		170	2725	25	85		45	6640	3500	7100	10	100	4075					10		27170
RSW Investments LLC													11385	11810							23195
CW Henderson													12765	8105							20870
Franklin Fund	650	2465	2190	4610	1985	925	285	75	385	980	1290	1645	1050	1170				25	25		19755
Individuals	3635	845	4305	1210	315	190	2175	740	1040	150	100	75	1750	805	135	300			5	635	18410
Invesco-Van Kampen												7220	7510								14730
STERLING CAPITAL					8000					5000											13000
Eaton Vance																		4100	4200	4300	12600
American Century											2505	2505	2505	2505	2505						12525
Glenmede Trust Company													8500								8500
Deutsche Bank Asset Management									8000												8000
Evercore Wealth Management LLC						5000	2000														7000
Appleton Partners, Inc.										6150											6150
Clark Capital Management Group Inc					6095																6095
Boston Company			300		25	100	125	50	175	100	125	150	150	175	2175		1000				4650
Colony Group					1500				2000												3500
Bailard Inc.								2000													2000
First Republic Bank				1000				1000													2000
Lord Abbett	115					100			600		725			245							1785
William Jones & Associates																	1000				1000
CIBC Private Wealth Advisors, Inc.	200		25								25										250
Columbia Management Advisors								25													25
<b>Grand Total</b>	<b>26655</b>	<b>33470</b>	<b>43895</b>	<b>95065</b>	<b>112895</b>	<b>104400</b>	<b>64485</b>	<b>85410</b>	<b>134940</b>	<b>103630</b>	<b>80160</b>	<b>63460</b>	<b>82345</b>	<b>87725</b>	<b>60680</b>	<b>32310</b>	<b>62855</b>	<b>57425</b>	<b>31890</b>	<b>20295</b>	<b>1383990</b>



## Mass AAA Water Deal Series 2022 Order Summary Update

Maturity	Coupon	ROY	Spread	Amount	Retail	Institutional	Stock	Priority Orders	Priority Orders	Priority Balance	Priority Subscription	PFM Reprice	UW Reprice	Difference	Final Reprice	Final Spread	Final Yield
2024	5.00%	2.54%	0 bps	18,640	19,455	7,200	4,500	26,655	10	(8,015)	143%	-1	0	(1)	-1	(1)	2.53%
2025	5.00%	2.56%	0 bps	20,940	19,220	14,250	4,500	33,470	8	(12,530)	160%	-1	0	(1)	-1	(1)	2.55%
2026	5.00%	2.61%	0 bps	21,645	13,500	30,395	4,500	43,895	13	(22,250)	203%	-2	0	(2)	-2	(2)	2.59%
2027	5.00%	2.63%	0 bps	22,385	35,510	59,555	4,500	95,065	25	(72,680)	425%	-4	-3	(1)	-4	(4)	2.59%
2028	5.00%	2.69%	3 bps	22,070	63,355	49,540	4,500	112,895	27	(90,825)	512%	-5	-3	(2)	-5	(2)	2.64%
2029	5.00%	2.74%	5 bps	22,745	64,030	40,370	8,500	104,400	26	(81,655)	459%	-5	-3	(2)	-5	0	2.69%
2030	5.00%	2.77%	7 bps	23,540	45,825	18,660	12,845	64,485	18	(40,945)	274%	-3	-1	(2)	-3	4	2.74%
2031	5.00%	2.79%	7 bps	24,370	64,360	21,050	10,980	85,410	19	(61,040)	350%	-4	-2	(2)	-4	3	2.75%
2032	5.00%	2.80%	7 bps	25,010	78,010	56,930	19,125	134,940	31	(109,930)	540%	-4	-3	(1)	-4	3	2.76%
2033	5.00%	2.82%	7 bps	25,910	55,015	48,615	13,265	103,630	21	(77,720)	400%	-5	-3	(2)	-5	2	2.77%
2034	5.00%	2.96%	10 bps	14,050	39,035	41,125	6,500	80,160	23	(66,110)	571%	-5	-3	(2)	-5	5	2.91%
2035	5.00%	3.08%	12 bps	14,525	43,020	20,440	4,500	63,460	18	(48,935)	437%	-5	-3	(2)	-5	7	3.03%
2036	5.00%	3.23%	15 bps	15,010	68,700	13,645	8,500	82,345	21	(67,335)	549%	-5	-3	(2)	-5	10	3.18%
2037	5.00%	3.33%	18 bps	15,530	75,055	12,670	8,500	87,725	25	(72,195)	565%	-5	-3	(2)	-5	13	3.28%
2038	5.00%	3.39%	20 bps	16,070	56,175	4,505	3,000	60,680	14	(44,610)	378%	-3	-1	(2)	-3	17	3.36%
2039	5.00%	3.40%	20 bps	16,540	27,310	5,000	3,000	32,310	7	(15,770)	195%	-3	0	(3)	-3	17	3.37%
2040	5.00%	3.43%	20 bps	17,135	40,090	22,765	5,000	62,855	13	(45,720)	367%	-3	-2	(1)	-3	17	3.40%
2041	5.00%	3.49%	20 bps	17,755	35,535	21,890	3,000	57,425	10	(39,670)	323%	-3	-2	(1)	-3	17	3.46%
2042	5.00%	3.51%	20 bps	18,400	18,490	13,400	3,000	31,890	9	(13,490)	173%	-2	0	(2)	-3	17	3.48%
2043	5.00%	3.54%	20 bps	19,075	710	19,585	4,000	20,295	6	(1,220)	106%	0	0	0	0	20	3.54%
<b>Totals:</b>				<b>391,345</b>	<b>862,400</b>	<b>521,590</b>	<b>136,215</b>	<b>1,383,990</b>	<b>344</b>	<b>0</b>	<b>354%</b>						



# **PFM's Post Pricing Analysis**



## Poll Question 6:

- ◆ How long after a primary market transaction has priced can secondary trades typically be considered reliable indicators of the primary market clearing levels?
- A. 6 Months
  - B. 1 Month
  - C. Settlement
  - D. 3 days



Non-PFM Issuer														
Series 2022														
Original Par Amount		Sale Date		Dated Date		Financial Advisor			Underwriter			Underlying Ratings		
1,871,420,000		3/18/2022		4/2/2022								Moody's - S&P AA+ Fitch AA+		
Trade Start Date		Trade End Date		Bond Insurer		Use of Proceeds			Tax Status					
3/18/2022		4/17/2022		Not Insured		Gen Purpose/Pub Impt			Tax Exempt					
Original Pricing Information								Secondary Market Statistics						
Reoffering Scale								Trades from 3/18/2021 to 4/16/2021						
Maturity	Par (\$000)	Coupon	Yield	Price	Insurer	BVAL	Yield vs. BVAL	Max Price	Total Volume (\$000)	# of Trades	Avg. Price	Avg. Spread	\$ Weighted Avg. Price	\$ Weighted Avg. Spread
3/15/2026	25,315,000	5.000%	0.47%	117.806		0.46%	1 bps	117.806	3,300,000	6	117.281	18 bps	117.781	2 bps
3/15/2027	41,800,000	5.000%	0.68%	121.085		0.57%	11 bps	121.392	1,300,000	16	120.838	21 bps	120.834	20 bps
3/15/2028	86,620,000	5.000%	0.87%	123.984		0.69%	18 bps	124.735	3,185,000	17	123.959	28 bps	124.387	20 bps
3/15/2029	97,830,000	5.000%	1.07%	126.335		0.81%	26 bps	127.454	6,765,000	13	126.874	24 bps	126.425	26 bps
3/15/2030	102,725,000	5.000%	1.29%	128.020		0.95%	34 bps	131.361	55,980,000	23	129.305	26 bps	129.138	28 bps
3/15/2031	107,845,000	5.000%	1.47%	129.570		1.08%	39 bps	133.305	36,210,000	23	130.896	31 bps	130.506	32 bps
3/15/2032	113,255,000	5.000%	1.60%	131.223		1.16%	44 bps	135.490	120,965,000	30	133.145	35 bps	132.855	36 bps
3/15/2033	75,905,000	5.000%	1.70%	130.152		1.21%	49 bps	134.742	159,970,000	36	132.622	35 bps	132.186	37 bps
3/15/2034	79,705,000	5.000%	1.76%	129.514		1.25%	51 bps	135.033	60,630,000	61	130.806	43 bps	130.941	41 bps
3/15/2035	45,000,000	4.000%	1.98%	128.880		1.30%	68 bps			no-trades				
3/15/2035	38,690,000	5.000%	1.82%	118.197		1.30%	52 bps	134.087	19,255,000	18	131.449	37 bps	131.710	37 bps
3/15/2036	87,420,000	5.000%	1.88%	128.249		1.35%	53 bps	131.217	20,915,000	6	129.723	43 bps	129.712	43 bps
3/15/2037	91,790,000	5.000%	1.93%	127.727		1.39%	54 bps	131.598	81,160,000	20	129.584	43 bps	129.951	39 bps
3/15/2038	96,385,000	4.000%	2.17%	116.329		1.43%	74 bps	120.675	101,515,000	23	118.242	60 bps	117.880	63 bps
3/15/2039	100,235,000	4.000%	2.21%	115.941		1.47%	74 bps	120.701	184,010,000	37	118.751	55 bps	117.966	60 bps
3/15/2040	104,240,000	4.000%	2.25%	115.553		1.51%	74 bps	120.301	192,225,000	43	118.201	56 bps	117.450	61 bps
3/15/2041	108,410,000	4.000%	2.29%	115.167		1.55%	74 bps	119.776	15,000,000	3	119.287	51 bps	119.287	51 bps
3/15/2042	112,735,000	4.000%	2.33%	114.783		1.59%	74 bps	117.540	8,030,000	7	117.142	59 bps	117.247	57 bps
3/15/2043	8,225,000	3.000%	2.54%	114.400		1.63%	91 bps	106.798	10,250,000	8	105.898	77 bps	105.732	83 bps
3/15/2043	37,030,000	4.000%	2.37%	104.029		1.63%	74 bps			no-trades				
3/15/2044	46,985,000	4.000%	2.41%	114.019		1.67%	74 bps	115.824	14,250,000	11	114.731	68 bps	115.421	63 bps
3/15/2045	48,865,000	5.000%	2.21%	124.846		1.70%	51 bps	126.068	25,000	1	126.068	48 bps	126.068	48 bps
3/15/2048	124,770,000	4.000%	2.49%	113.260		1.75%	74 bps	118.455	48,805,000	78	115.496	56 bps	115.118	62 bps
3/15/2050	42,855,000	5.000%	2.29%	124.038		1.77%	52 bps	127.972	51,000,000	11	126.588	39 bps	126.874	39 bps
3/15/2052	46,785,000	3.000%	2.73%	102.342		1.79%	94 bps	105.810	64,225,000	54	103.589	86 bps	104.035	85 bps

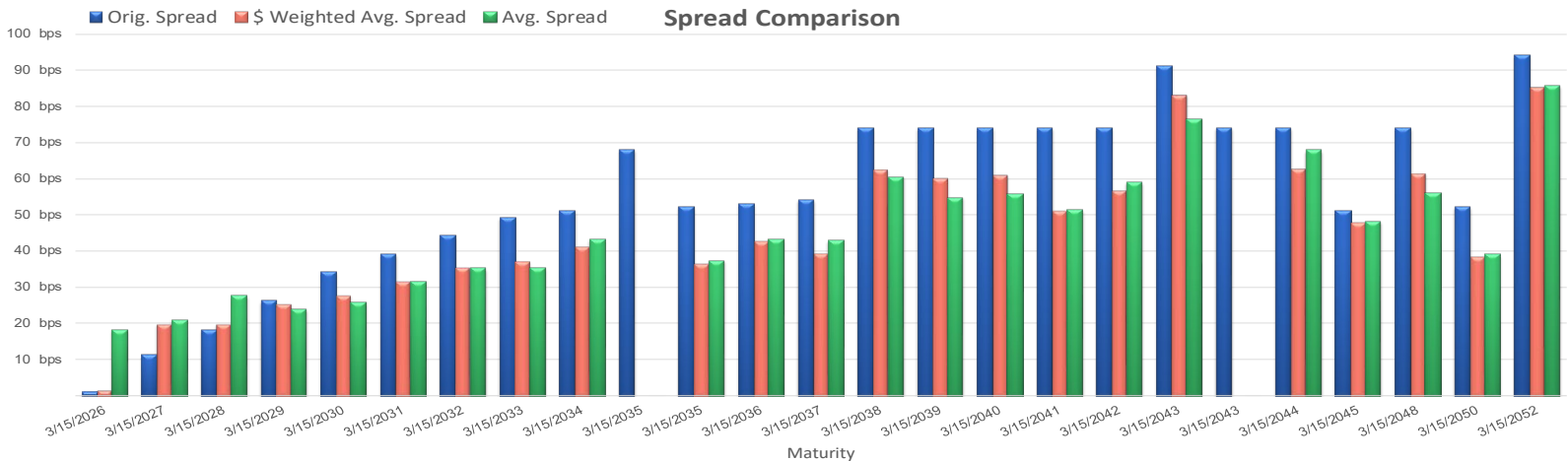


# Trade Evaluator (Continued)

Non-PFM Issuer

Series 2022

<b>Original Par Amount</b> 1,871,420,000	<b>Sale Date</b> 3/18/2022	<b>Dated Date</b> 4/2/2022	<b>Financial Advisor</b>	<b>Underwriter</b>	<b>Ratings</b> Moody's - S&P AA+ Fitch AA+
<b>Trade Start Date</b> 3/18/2022	<b>Trade End Date</b> 4/17/2022	<b>Bond Insurer</b> Not Insured	<b>Use of Proceeds</b> Gen Purpose/Pub Impt	<b>Tax Status</b> Tax Exempt	







- **Question or Comments.**

**Contact us at: [PricingGroup@pfm.com](mailto:PricingGroup@pfm.com)**



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