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Building Financial Resilience: How Water Utilities Should Size and Invest Reserves

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If you don't know where you are going, any road will get you there.
– Lewis Carroll

When investing, reinvesting, purchasing, acquiring, exchanging, selling, or managing public funds, the **primary objective** of a trustee shall be to **safeguard the principal of the funds** under its control.

The **secondary objective** shall be to meet the **liquidity needs** of the depositor.

The **third objective** shall be to **achieve a return** on the funds under its control.

Suitability – Building a Plan with Purposeful Evaluation

In a room full of public fund managers, when asked the question, “In importance, how do you rank the objectives of safety, liquidity and income in the performance of your job?” most of the respondents would rank safety and liquidity combined at 80 percent to 90 percent. In light of the above example, why then would the typical performance evaluation be based on a portfolio’s total return – or even a peer group comparison – given that, of the three policy objectives, return receives the lowest priority?

- 1) Performance Evaluation involves both qualitative and quantitative components to form the basis for reporting how well a manager is doing in meeting investment objectives.
- 2) Suitability is the one standard that can “specify performance measures as are appropriate for the nature and size of the public funds within the custody or the unit of local government”
- 3) The five “we’s” of suitability sets a baseline for questions to be answered while developing a strategy.

Five Points of Suitability

- Questions you should ask yourself to evaluate performance.



Liquidity

Is there adequate liquidity to meet operating expenses without the need to sell bonds before maturity?



Duration

Is the portfolio exposed to an appropriate level of interest rate risk (duration) in the portfolio?



Allocation

Does the portfolio have a diversified asset allocation along type, structure and maturity timeframes?



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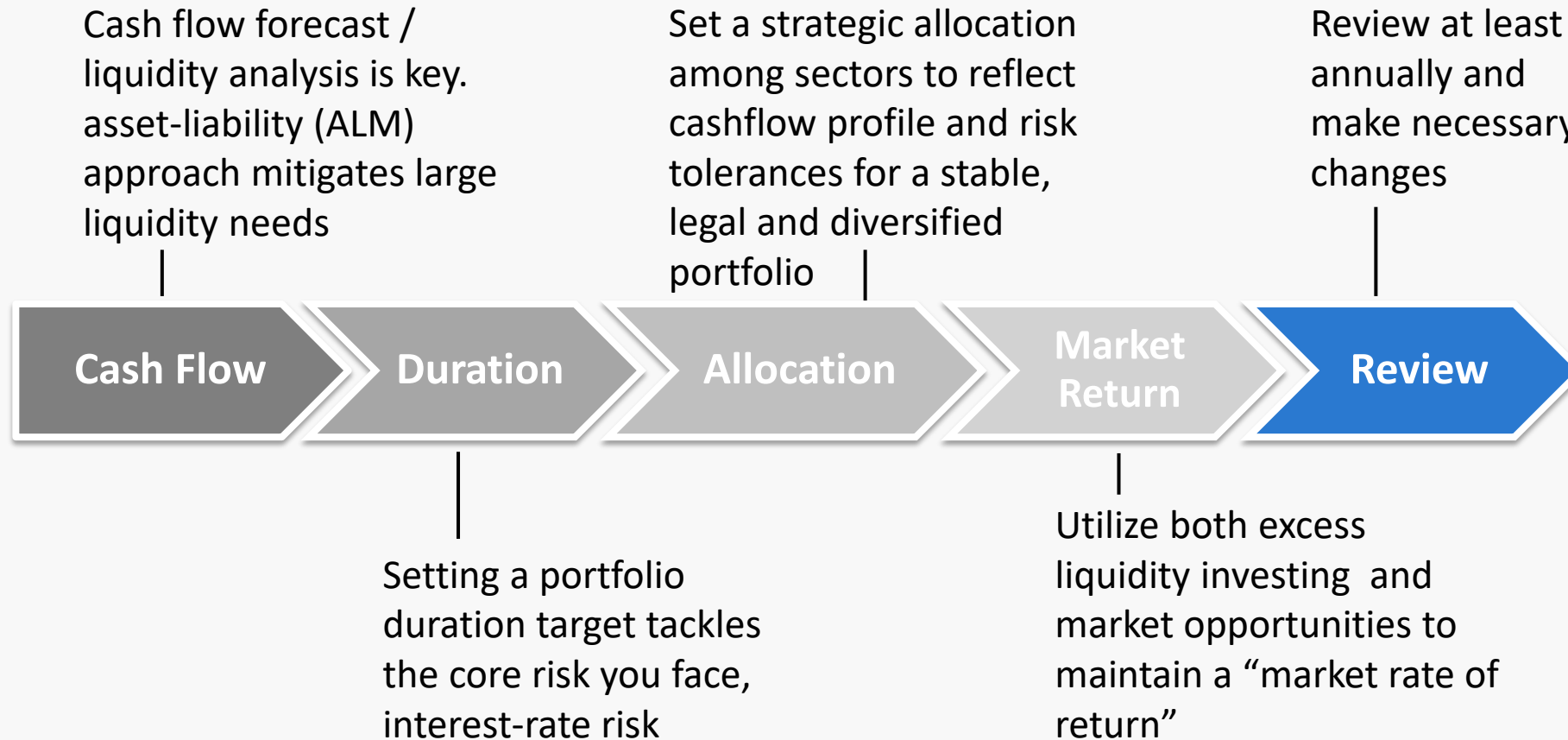
Does the portfolio meet compliance and policy/statute constraints?



Earnings

Is the portfolio earning a “market rate of return” through budgetary and economic cycles?

Strategy Development Steps for Public Investors



“Don’t Beat the Market, Be the Market”

Harvard Endowment: Had 230 employees until 2017, Top 6 executives took home over \$40MM in compensation.

Lost to S&P index by over 100bp over last 20 years and almost 500Bp over past 10 years.

Lost to the S&P annually for the last 12 years straight.

5 Takeaway’s:

- Performance Persistence is Rare:
 - Harvard’s few moments of glory have been dwarfed by it’s failures.
- Overconfidence is an obstacle:
 - Those who have seen success get complacent and assume they are smarter than they really are.
- Reversion to the mean is powerful:
 - Sector outperformance comes and goes and is hard to predict.
- Many years of skill required to beat luck:
 - Statistically speaking, you would need many decades to understand if manager is superior.
- Indexes are hard to beat:
 - Harvard would have even lost out to a blended portfolio of 60% stocks, 40% US Bonds over last 20 years.

The best and brightest

Annualized total return through June 30, 2020



Source: Harvard Management Company; The Harvard Crimson; www.HulbertRatings.com

“Don’t Beat the Market, Be the Market”

What does Nevada’s \$35 billion fund manager do all day? Nothing.



Image: The Wall Street Journal

Steve Edmundson has no co-workers, rarely takes meetings and often eats leftovers at his desk. With that dynamic workday, the investment chief for the Nevada Public Employees’ Retirement System is out-earning pension funds that have hundreds on staff.

His daily trading strategy: Do as little as possible, usually nothing.

The Nevada system’s stocks and bonds are all in low-cost funds that mimic indexes. Edmundson may make one change to the portfolio a year.

Nevada PERS December 31, 2023 Performance Gross of Fees										
Asset Class	Sub-Asset Class	Market Value (Millions)	Target Allocation	Actual Allocation	FYTD Return	One Year	3 Years	5 Years	10 Years	Since Inception
U.S. Stocks	S&P 500 Index	\$ 24,767	41.0%	41.0%	8.1%	26.3%	10.1%	15.7%	12.0%	10.7%
	Total U.S. Stocks	\$ 24,767	41.0%	41.0%	8.1%	26.3%	10.1%	15.7%	12.0%	11.4%
	Market Return				8.0%	26.3%	10.0%	15.7%	12.0%	11.6%
International Stocks	MSCI World x US Index	\$ 9,476	16.0%	15.7%	6.0%	18.1%	4.8%	8.8%	4.7%	5.9%
	Total Intl. Stocks	\$ 9,477	16.0%	15.7%	6.0%	18.1%	4.8%	8.8%	4.7%	5.6%
	Market Return				6.0%	17.9%	4.4%	8.5%	4.4%	5.1%
U.S. Bonds	US Bond Index	\$ 16,520	28.0%	27.4%	2.3%	3.9%	-1.0%	2.4%	2.3%	4.2%
	Total U.S. Bonds	\$ 16,520	28.0%	27.4%	2.3%	3.9%	-1.0%	2.4%	2.3%	6.5%
	Market Return				2.4%	4.1%	-1.1%	2.3%	2.3%	6.5%
Private Markets	Private Real Estate	\$ 2,869	6.0%	4.8%	-4.8%	-10.7%	3.8%	4.6%	7.4%	7.3%
	Private Equity	\$ 4,787	6.0%	7.9%	2.1%	5.4%	16.9%	18.0%	17.0%	13.5%
	Total Private Markets	\$ 7,656	12.0%	12.7%	-0.6%	-1.2%	11.7%	12.4%	12.7%	10.6%
	Market Return				4.0%	13.0%	9.6%	12.5%	11.4%	8.6%
Cash		\$ 1,959	3.0%	3.2%						
Total PERS' Fund		\$ 60,379	100.0%	100.0%	4.8%	14.4%	6.3%	10.8%	8.2%	9.4%
Market Return					5.6%	16.7%	6.0%	10.5%	8.0%	9.1%

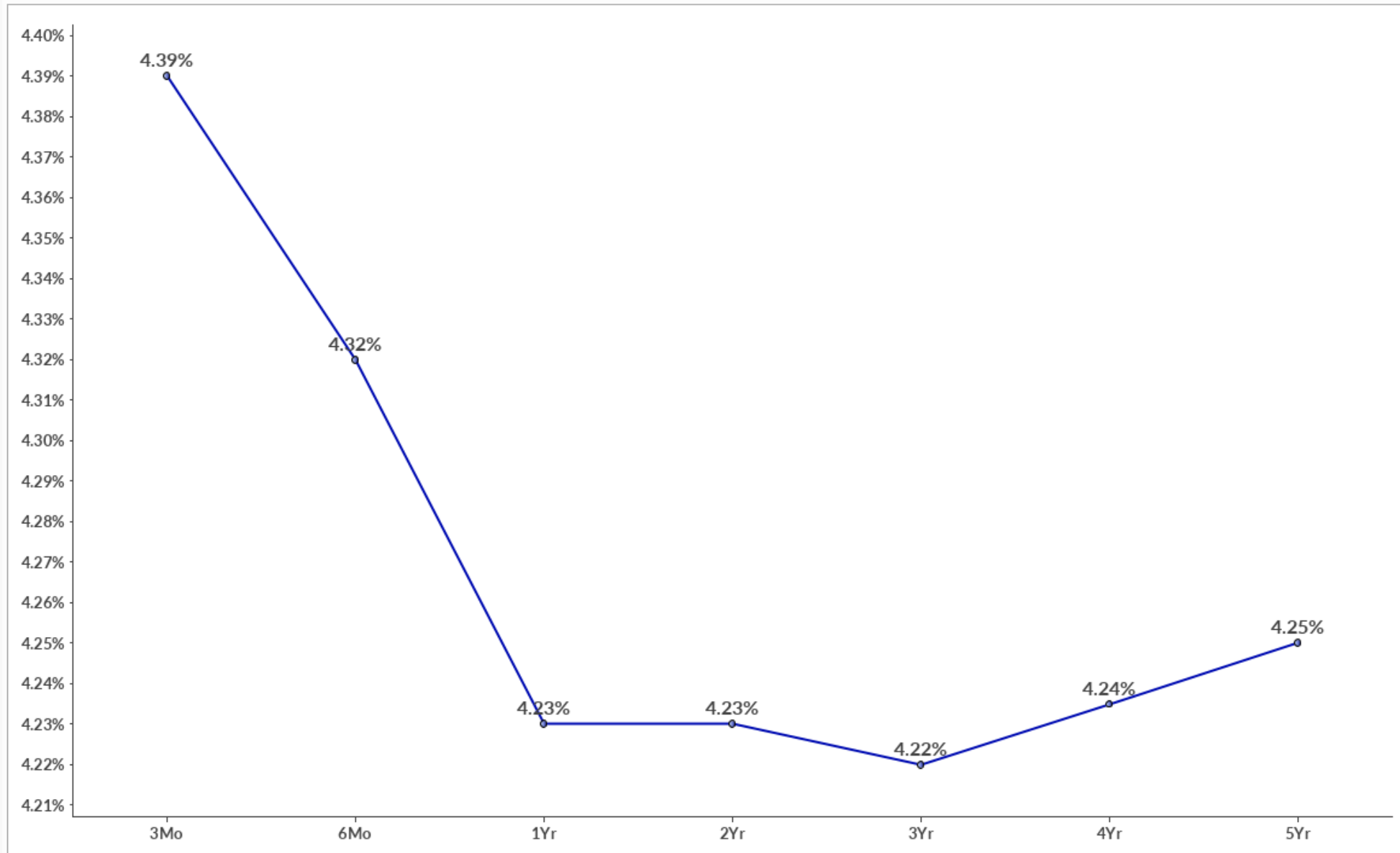
Source: Nvpers

Edmundson’s do-nothing strategy slightly outperformed the market per year over the past three, five, and ten years.

And this is the most awesome fact: over the past five and ten years, he beat the pants off 90% of US pension funds, with over \$1 billion in assets, based on data from pension fund tracker Callan Associates.

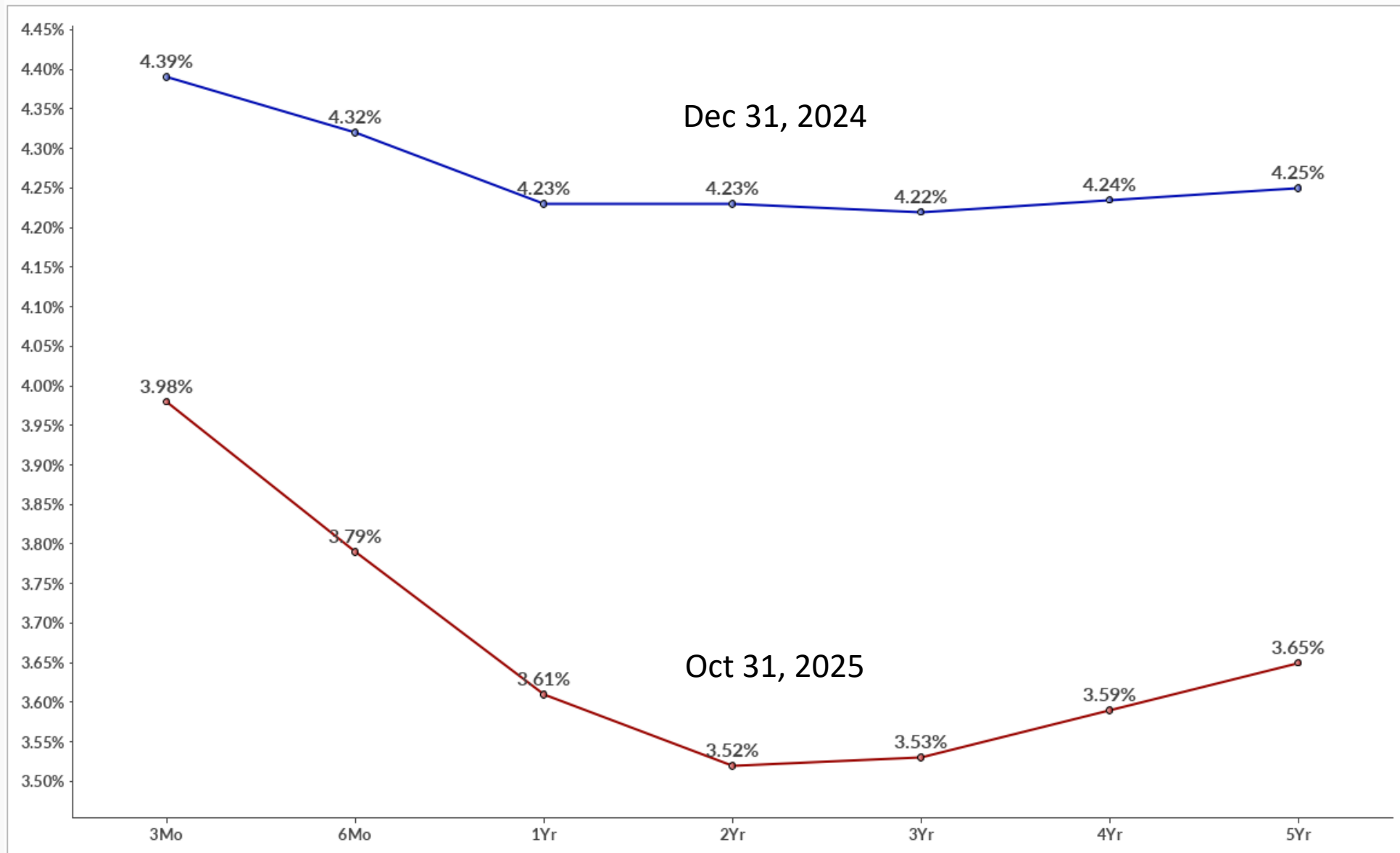
Treasury Yield Curve Dec 31, 2024

What would you choose?



Treasury Yield Curves

What would you choose?



Interest Rate Speculation

Rates: Aug 1983 to Sep 2025

\$100MM Portfolio

The Truth About Flat Yield Curves



Speculate Holding 3Mo Tbill in Lieu of Longer Bond
Dates Reviewed: 08/31/1983 To 09/30/2025

Buy 3MoTbill ▼

Start Date 08/31/1983

Portfolio Size \$100,000,000.00

End Date 09/30/2025

3Mo TBill vs.	Observations in Months	Observations in Years	Number of Times Shorter Bond Wins	% of Wins	Number of Times Shorter Bond Loses	% of Losses	Average Annual Basis Point Win	Average Annual Basis Point Loss	Average Performance of Staying in Short Bond Over Period in Basis Points Annually	Average Performance of Staying in Short Bond Over Holding Period in Dollars	Average Spread of Shorter Bond to Buy Bond at Decision Time
Buy 2YrTsy	506	42.17	118	23.32%	388	76.68%	66.83	(126.27)	(81.24)	(\$1,624,733.20)	(66.89)
Buy 5YrTsy	506	42.17	57	11.26%	449	88.74%	111.79	(200.98)	(165.75)	(\$8,287,519.76)	(116.07)



Speculate Holding 3Mo Tbill in Lieu of Longer Bond
Dates Reviewed: 08/31/1983 To 09/30/2025

Buy 3MoTbill ▼

Start Date 08/31/1983

Portfolio Size \$100,000,000.00

End Date 09/30/2025

3Mo Spread at Decision

0

3Mo TBill vs.	Observations in Months	Observations in Years	Number of Times Shorter Bond Wins	% of Wins	Number of Times Shorter Bond Loses	% of Losses	Average Annual Basis Point Win	Average Annual Basis Point Loss	Average Performance of Staying in Short Bond Over Period in Basis Points Annually	Average Performance of Staying in Short Bond Over Holding Period in Dollars	Average Spread of Shorter Bond to Buy Bond at Decision Time
Buy 2YrTsy	52	4.33	11	21.15%	41	78.85%	65.15	(152.39)	(106.38)	(\$2,127,500.00)	29.33
Buy 5YrTsy	59	4.92	20	33.90%	39	66.10%	132.43	(277.24)	(138.37)	(\$6,918,644.07)	52.25

Speculation Miscalculation

In 2014, the Bernalillo County Treasurer's office, under then-Treasurer Manny Ortiz and former Treasurer/Investment Officer Patrick Padilla, faced a major scandal for losing **nearly \$20 million in taxpayer money** due to risky investments. A subsequent audit found an additional \$900 million in questionable investments with incomplete or no records.

Investment Losses: The county was forced to sell long-term investments at an approximately \$17 million loss in 2014 to meet its immediate cash flow needs (liquidity).

Audits and Investigations: State Auditor Hector Balderas initiated a special audit due to concerns about bond investments and payments to brokers, which revealed high-risk strategies and a lack of proper documentation. The New Mexico Securities Division also got involved, alleging that two brokerage firms, Oppenheimer & Co., Inc. and BOSC Inc., and their brokers did not exercise due diligence with public funds.

Can't Beat the Market, So Now What?

- Public entities generally exhibit predictive cash flows in both magnitude and timing.
- This allows public funds to create duration optimized (interest rate risk centric) allocations.
- Allocations should reflect the legal guidance of the investment policy and the desired weights of allowable sectors based on risk/reward and ALM preferences.
- Portfolio construction: Safety (IR Risk, credit), liquidity, diversified, legal, market rate of return.



Duration, Duration, Duration!

Being invested is more important than the allocation decision!

Moving from Cash to two duration in Treasuries:

Pickup approx 30Bp Avg Yield

Moving from two duration in Treasuries to two duration in Agency Bullets

Pickup approx 7Bp Avg Yield

Moving from two duration in Agency Bullets to maturity matched Agency Callables:

Pickup approx 12Bp in Avg Yield



Custom Model Stats

Analysis Dates: Dec 31, 2014 - Dec 31, 2024

MODEL WEIGHTING		Cash Proxy	Treasury	Agency Bullet	Agency Callable
L0US	OVERNIGHT CASH	100.00%			
G0QA	Treasury 0-1Yr		34.00%		
H541	Agy Composite 0-1Yr			32.00%	32.00%
G1O2	Treasury 1-3Yr		36.00%		
G1PB	Agy Bullet 1-3Yr			37.00%	
G1PC	Agy Callable 1-3Yr				37.00%
G2O2	Treasury 3-5Yr		30.00%		
G2PB	Agy Bullet 3-5Yr			31.00%	
G2PC	Agy Callable 3-5Yr				31.00%

MODEL STATS	Annualized Total Return	Annualized Price Return	Annualized Income Return	Annualized Std Dev Total Return	Avg Yield to Worst	Std Dev Yld	Avg Eff Dur
Cash Proxy	1.760%	0.000%	1.760%	0.553%	1.725%	1.886%	0.003
Treasury	1.506%	(0.369%)	1.819%	1.641%	2.018%	1.595%	1.982
Agency Bullet	1.631%	(0.558%)	2.092%	1.575%	2.083%	1.592%	1.981
Agency Callable	1.339%	(0.295%)	1.594%	1.407%	2.202%	1.658%	1.427

Approaches for Determining Portfolio Duration

Cash Flow Based - ALM

- Utilizes cash flow analysis to measure the timing and magnitude of liabilities.
- Uses immunization techniques utilized in the insurance and pension world to measure individual liability streams.
- These liability streams are combined and weighted to derive a total portfolio duration that will suffice to match the liability needs.



CA Investment Primer – Portfolio Structuring

“One of the most important objectives in the investment of public funds is ensuring that funds are available to fund an organization’s cashflow needs. Investment officials **must** identify periods when cash will be needed from the portfolio and **invest funds to mature on those dates.**

Furthermore, most investment officials will want to provide a cushion of cash to meet unexpected cash outlays. This cushion may be maintained in short-term investments, money market funds, or in LAIF.”

“In developing a portfolio structuring strategy, it is the investor’s primary goal to balance the portfolio’s safety and liquidity with the **secondary** goal of yield. Safety is achieved through careful selection and monitoring of high credit quality investments and **matching maturities of investments to cash needs.**”



Approaches for Determining Portfolio Duration

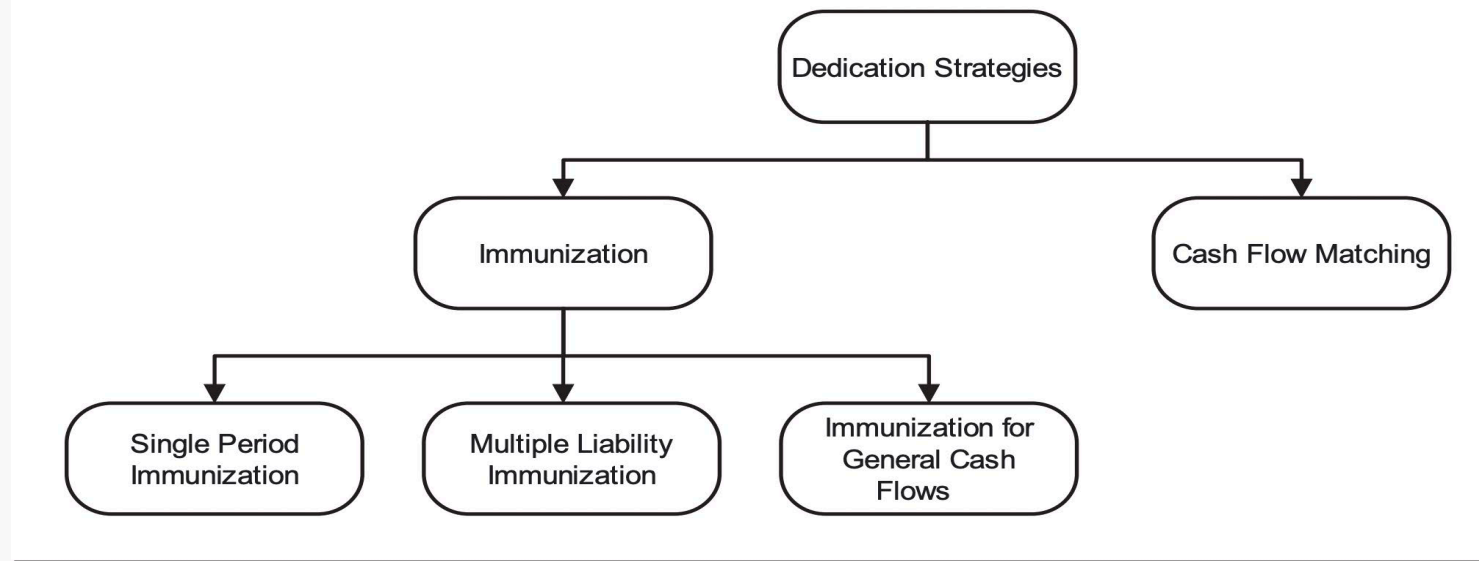
Cash Flow Based Approach

ALM Analysis

Dedication Strategy: Specialized fixed-income strategy designed to accommodate specific funding needs of the investor. They generally are classified as passive in nature, although it is possible to add some active management elements to them.

Exhibit 6

Dedication Strategies



Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 1 – Liquidity Profile

Enter Receipts and Disbursements for 36 months (or desired length) to calculate Net Cash Flow per month over the last three years.

If data is difficult to obtain, a portfolio proxy can be used by utilizing the month over month change in book value of the portfolio as the net cash flow.

		Cash Flow Entry Sample City Update Data		
	Date	Receipts	Expenditures	Net Flow
1	08/31/2018	\$24,471,632.81	\$26,953,467.16	(\$2,481,834.35)
2	09/30/2018	\$23,559,974.56	\$25,279,925.18	(\$1,719,950.62)
3	10/31/2018	\$30,230,063.91	\$32,487,689.44	(\$2,257,625.53)
4	11/30/2018	\$51,936,945.68	\$29,593,564.84	\$22,343,380.84
5	12/31/2018	\$24,127,233.19	\$36,589,847.89	(\$12,462,614.70)
6	01/31/2019	\$24,918,896.36	\$38,186,973.19	(\$13,268,076.83)
7	02/28/2019	\$25,734,823.79	\$29,043,844.20	(\$3,309,020.41)
8	03/31/2019	\$16,548,385.34	\$27,337,583.28	(\$10,789,197.94)
9	04/30/2019	\$20,508,348.59	\$29,534,947.01	(\$9,026,598.42)
10	05/31/2019	\$89,102,085.61	\$36,728,474.91	\$52,373,610.70
11	06/30/2019	\$45,733,196.26	\$41,057,162.97	\$4,676,033.29
12	07/31/2019	\$28,962,367.65	\$32,115,824.92	(\$3,153,457.27)
13	08/31/2019	\$27,149,309.89	\$30,267,442.20	(\$3,118,132.31)
14	09/30/2019	\$20,715,835.31	\$26,719,598.11	(\$6,003,762.80)
15	10/31/2019	\$26,003,560.74	\$32,235,031.27	(\$6,231,470.53)
16	11/30/2019	\$62,252,076.52	\$37,799,795.37	\$24,452,281.15
17	12/31/2019	\$29,319,020.67	\$40,322,210.03	(\$11,003,189.36)
18	01/31/2020	\$28,241,721.32	\$43,668,419.60	(\$15,426,698.28)
19	02/29/2020	\$31,291,231.95	\$34,078,791.63	(\$2,787,559.68)
20	03/31/2020	\$19,500,350.84	\$37,131,753.46	(\$17,631,402.62)
21	04/30/2020	\$16,677,064.70	\$26,304,041.58	(\$9,626,976.88)
22	05/31/2020	\$88,324,955.64	\$48,333,158.15	\$39,991,797.49
23	06/30/2020	\$52,111,610.18	\$46,363,012.78	\$5,748,597.40
24	07/31/2020	\$33,638,613.02	\$34,979,405.09	(\$1,340,792.07)
25	08/31/2020	\$28,346,100.41	\$31,194,182.34	(\$2,848,081.93)
26	09/30/2020	\$22,215,127.23	\$32,450,056.41	(\$10,234,929.18)
27	10/31/2020	\$20,081,784.50	\$35,741,768.07	(\$15,659,983.57)
28	11/30/2020	\$62,542,916.58	\$36,943,063.72	\$25,599,852.86
29	12/31/2020	\$30,429,996.34	\$42,419,717.79	(\$11,989,721.45)
30	01/31/2021	\$30,074,891.47	\$43,632,363.40	(\$13,557,471.93)
31	02/28/2021	\$31,592,189.05	\$34,700,203.72	(\$3,108,014.67)
32	03/31/2021	\$20,648,902.89	\$34,525,669.42	(\$13,876,766.53)
33	04/30/2021	\$30,150,467.58	\$37,415,760.79	(\$7,265,293.21)
34	05/31/2021	\$99,478,439.49	\$48,720,733.83	\$50,757,705.66
35	06/30/2021	\$44,395,717.46	\$43,679,333.78	\$716,383.68
36	07/31/2021	\$37,275,538.69	\$34,980,269.97	\$2,295,268.72

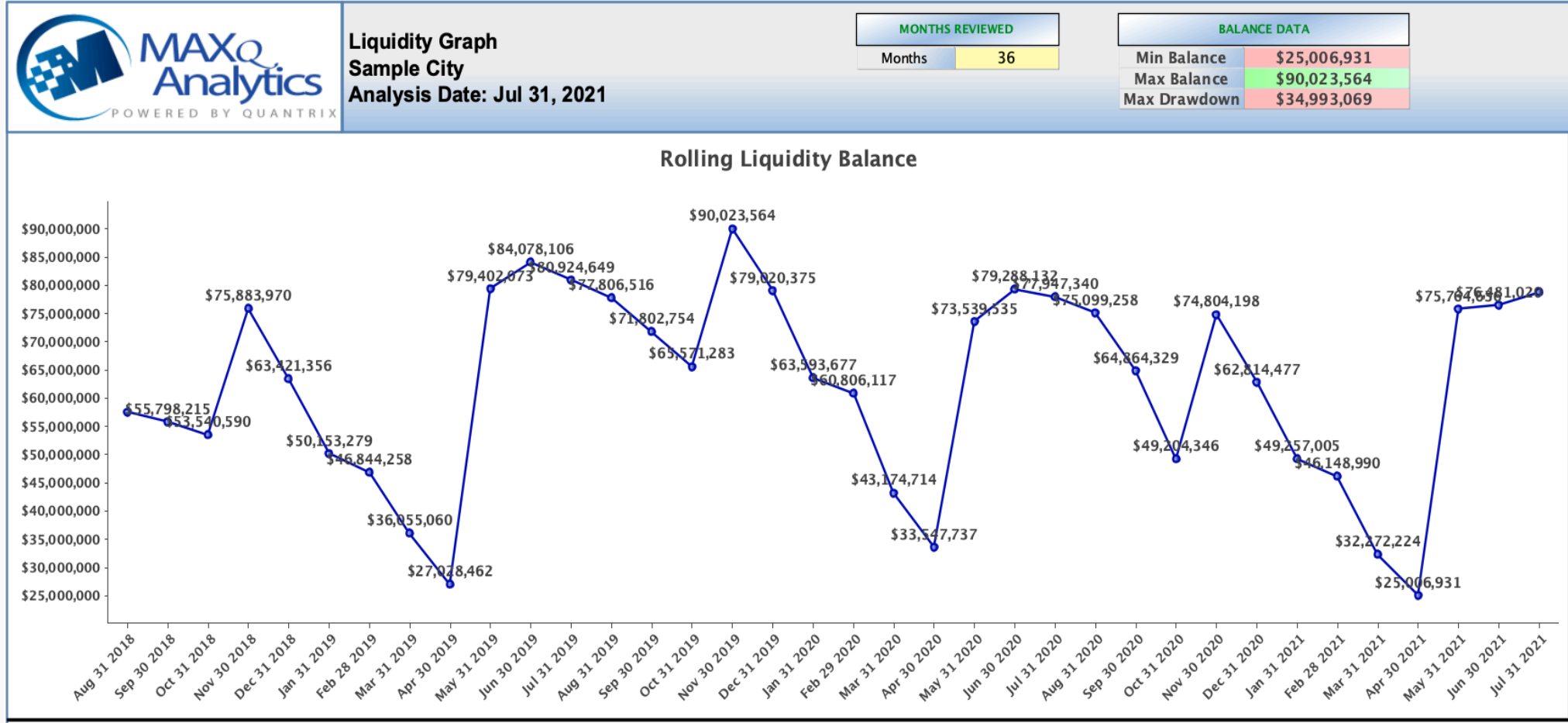
Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 1 – Liquidity Profile

Institution Name	Sample City
Portfolio Balance	\$300,000,000.00
Primary Liquidity	\$60,000,000.00
Analysis Date	07/31/2021



Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 1 – Liquidity Profile

Liquidity Buffer	1.50
Liquidity %	17.50%

Rolling Liquidity Evaluation	36	
	Value	Date
Minimum Balance	\$25,006,930.66	
Maximum Balance	\$90,023,564.27	
Maximum Drawdown	(\$34,993,069.34)	4/30/21
Required Liquidity		Multiplier
Strategic Primary Liquidity	\$34,993,069.34	1.00x / 11.7%
Strategic Book Liquidity	\$34,993,069.34	1.00x / 11.7%
Strategic Total Liquidity	\$69,986,138.68	2.00x / 23.3%
Actual Liquidity		Multiplier
Actual Primary Liquidity	\$60,000,000.00	1.71x / 20.0%
Actual Book Liquidity	\$0.00	0.00x / 0.0%
Actual Total Liquidity	\$60,000,000.00	1.71x / 20.0%
Investable Liquidity		% Change
Investable Primary Liquidity	\$25,006,930.66	41.68%
Investable Book Liquidity	(\$34,993,069.34)	N/A
Total Investable Liquidity	(\$9,986,138.68)	N/A

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 2 – Projected Cash Flows

Using your own assumptions or average/worst case cash flow projections, we can establish a liability ladder to measure against.

These projections are the net inflow and outflow expectations laddered over the policy limited timeframe of the portfolio.

Projected Net Cash Flows by Year		Worst Outflow	Average Outflow	User Outflow
1	August	(\$3,118,132.31)	(\$2,816,016.20)	
	September	(\$10,234,929.18)	(\$5,986,214.20)	
	October	(\$15,659,983.57)	(\$8,049,693.21)	
	November	\$22,343,380.84	\$24,131,838.28	
	December	(\$12,462,614.70)	(\$11,818,508.50)	
	January	(\$15,426,698.28)	(\$14,084,082.35)	
	February	(\$3,309,020.41)	(\$3,068,198.25)	
	March	(\$17,631,402.62)	(\$14,099,122.36)	
	April	(\$9,626,976.88)	(\$8,639,622.84)	
	May	\$39,991,797.49	\$47,707,704.62	
	June	\$716,383.68	\$3,713,671.46	
	July	(\$3,153,457.27)	(\$732,993.54)	
2	August	(\$3,118,132.31)	(\$2,816,016.20)	
	September	(\$10,234,929.18)	(\$5,986,214.20)	
	October	(\$15,659,983.57)	(\$8,049,693.21)	
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Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

Year 1 Modified Monthly Duration = $5.815 / (1 + (\text{Wtd Avg Tsy yield} / 12)) = 5.810$

Year 1 Annualized Modified Duration = $5.810 / 12 = .484$

Duration Optimization Calcs		NetFlow	NegNetFlow	Hedge Security	PV Rate	Period	PV NegFlow	PV Factor	Weight	PeriodWt
1	August	(\$2,816,016.20)	(\$2,816,016.20)	3Mo Tsy	0.946%	1	\$2,813,797.84	0.999	4.08%	0.041
	September	(\$5,986,214.20)	(\$5,986,214.20)	3Mo Tsy	0.946%	2	\$5,976,786.48	0.998	8.67%	0.173
	October	(\$8,049,693.21)	(\$8,049,693.21)	3Mo Tsy	0.946%	3	\$8,030,684.44	0.998	11.65%	0.349
	November	\$24,131,838.28								
	December	(\$11,818,508.50)	(\$11,818,508.50)	6Mo Tsy	1.040%	5	\$11,767,443.55	0.996	17.07%	0.853
	January	(\$14,084,082.35)	(\$14,084,082.35)	6Mo Tsy	1.040%	6	\$14,011,089.19	0.995	20.32%	1.219
	February	(\$3,068,198.25)	(\$3,068,198.25)	9Mo Tsy	1.101%	7	\$3,048,568.85	0.994	4.42%	0.310
	March	(\$14,099,122.36)	(\$14,099,122.36)	9Mo Tsy	1.101%	8	\$13,996,081.63	0.993	20.30%	1.624
	April	(\$8,639,622.84)	(\$8,639,622.84)	9Mo Tsy	1.101%	9	\$8,568,621.70	0.992	12.43%	1.119
	May	\$47,707,704.62								
	June	\$3,713,671.46								
	July	(\$732,993.54)	(\$732,993.54)	1.00Yr Tsy	1.162%	12	\$724,530.44	0.988	1.05%	0.126
2	August	(\$2,816,016.20)	(\$2,816,016.20)	1.25Yr Tsy	1.193%	13	\$2,779,866.49	0.987	4.09%	0.531
	September	(\$5,986,214.20)	(\$5,986,214.20)	1.25Yr Tsy	1.193%	14	\$5,903,497.88	0.986	8.68%	1.215
	October	(\$8,049,693.21)	(\$8,049,693.21)	1.25Yr Tsy	1.193%	15	\$7,930,578.28	0.985	11.66%	1.748
	November	\$24,131,838.28								
	December	(\$11,818,508.50)	(\$11,818,508.50)	1.50Yr Tsy	1.225%	17	\$11,615,346.67	0.983	17.07%	2.902
	January	(\$14,084,082.35)	(\$14,084,082.35)	1.50Yr Tsy	1.225%	18	\$13,827,863.69	0.982	20.32%	3.658
	February	(\$3,068,198.25)	(\$3,068,198.25)	1.75Yr Tsy	1.256%	19	\$3,007,817.97	0.980	4.42%	0.840
	March	(\$14,099,122.36)	(\$14,099,122.36)	1.75Yr Tsy	1.256%	20	\$13,807,209.12	0.979	20.29%	4.059
	April	(\$8,639,622.84)	(\$8,639,622.84)	1.75Yr Tsy	1.256%	21	\$8,451,898.98	0.978	12.42%	2.609
	May	\$47,707,704.62								
	June	\$3,713,671.46								
	July	(\$732,993.54)	(\$732,993.54)	2.00Yr Tsy	1.287%	24	\$714,372.32	0.975	1.05%	0.252

Macaulay Dur = Sum
PeriodWt = 5.815

Macaulay Dur = Sum
PeriodWt = 17.814

Year 2 Modified Monthly Duration = $17.814 / (1 + (\text{Wtd Avg Tsy yield} / 12)) = 17.795$

Year 2 Annualized Mod Duration = $17.795 / 12 = 1.483$

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

Once the annualized durations are calculated, we now weight each year based on our preference of coverage of each year's total liabilities.

Duration Optimization Values by Year		
1	<i>Annualized Duration</i>	<i>0.484</i>
2	<i>Annualized Duration</i>	<i>1.483</i>
3	<i>Annualized Duration</i>	<i>2.481</i>
4	<i>Annualized Duration</i>	<i>3.480</i>
5	<i>Annualized Duration</i>	<i>4.477</i>

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

Portfolio Size	\$300,000,000.00
Immunized Portfolio	\$299,992,155.11
Percent Immunized	100.00%

Immunization Weight	
Year 1	90.00%
Year 2	70.50%
Year 3	70.00%
Year 4	70.00%
Year 5	70.00%

The total immunization weights for each year should create a portfolio that is 100% immunized relative to the portfolio size.

Duration Optimization Values by Year		
1	Sum Present Value of Outflows	\$68,937,604.13
	Sum of Asset Matched Present Values	\$62,043,843.72
	Asset Matched Weight in Portfolio	20.681%
	Annual Total Liquidity Coverage Required	\$6,893,760.41
	Annualized Duration	0.484
	Weighted Duration	0.100
2	Sum Present Value of Outflows	\$68,038,451.40
	Sum of Asset Matched Present Values	\$47,967,108.24
	Asset Matched Weight in Portfolio	15.989%
	Annual Total Liquidity Coverage Required	\$20,071,343.16
	Annualized Duration	1.483
	Weighted Duration	0.237
3	Sum Present Value of Outflows	\$66,942,361.12
	Sum of Asset Matched Present Values	\$46,859,652.79
	Asset Matched Weight in Portfolio	15.620%
	Annual Total Liquidity Coverage Required	\$20,082,708.34
	Annualized Duration	2.481
	Weighted Duration	0.388

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

Duration Estimation and Allocation Bucket Approximation	
Starting Liquidity	\$52,500,000.00
1Yr Min Liquidity	\$47,360,819.51
Weighted Average Cash Flow Duration	1.92
Cash (Liquidity Profile)	17.50%
0-1Yr	20.68%
1-3Yr	31.61%
3-5Yr	30.21%

Sum of Weighted Durations
(4 & 5 Year Not Shown)

Duration Optimization Values by Year		
1	Sum Present Value of Outflows	\$68,937,604.13
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Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

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Starting Liquidity	\$52,500,000.00
1Yr Min Liquidity	\$47,360,819.51
Weighted Average Cash Flow Duration	1.92
Cash (Liquidity Profile)	17.50%
0-1Yr	20.68%
1-3Yr	31.61%
3-5Yr	30.21%

Sum of Asset Matched Weights
(4 & 5 Year Not Shown)

Duration Optimization Values by Year		
1	Sum Present Value of Outflows	\$68,937,604.13
	Sum of Asset Matched Present Values	\$62,043,843.72
	Asset Matched Weight in Portfolio	20.681%
	Annual Total Liquidity Coverage Required	\$6,893,760.41
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	Asset Matched Weight in Portfolio	15.989%
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	Sum of Asset Matched Present Values	\$46,859,652.79
	Asset Matched Weight in Portfolio	15.620%
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	Annualized Duration	2.481
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Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

Step 3 – DCF/Duration Analysis of Cash Flows

Duration Estimation and Allocation Bucket Approximation	
Starting Liquidity	\$52,500,000.00
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3-5Yr	30.21%

Duration Optimization Values by Year		
1	Sum of Asset Matched Present Values	\$62,043,843.72
	Weighted Duration	0.100
2	Sum of Asset Matched Present Values	\$47,967,108.24
	Weighted Duration	0.237
3	Sum of Asset Matched Present Values	\$46,859,652.79
	Weighted Duration	0.388
4	Sum of Asset Matched Present Values	\$45,889,528.29
	Weighted Duration	0.532
5	Sum of Asset Matched Present Values	\$44,732,022.07
	Weighted Duration	0.668

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

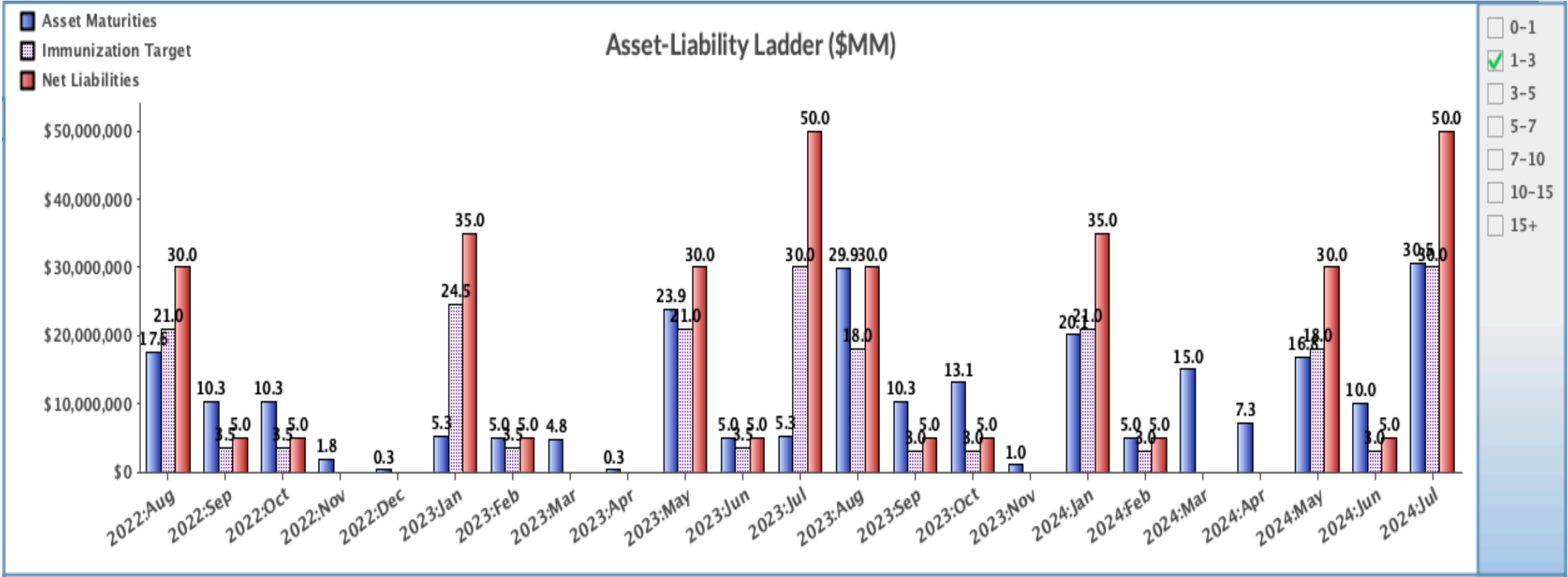
ALM Analysis

		NetFlow	PV NegFlow	Assets Needed	1Yr Liquidity Change	1Yr Liquidity Rolling Balance
1	August	(\$2,816,016.20)	\$2,813,797.84	\$2,532,418	(\$281,380)	\$52,218,620
	September	(\$5,986,214.20)	\$5,976,786.48	\$5,379,108	(\$597,679)	\$51,620,942
	October	(\$8,049,693.21)	\$8,030,684.44	\$7,227,616	(\$803,068)	\$50,817,873
	November	\$24,131,838.28			\$1,682,127	\$52,500,000
	December	(\$11,818,508.50)	\$11,767,443.55	\$10,590,699	(\$1,176,744)	\$51,323,256
	January	(\$14,084,082.35)	\$14,011,089.19	\$12,609,980	(\$1,401,109)	\$49,922,147
	February	(\$3,068,198.25)	\$3,048,568.85	\$2,743,712	(\$304,857)	\$49,617,290
	March	(\$14,099,122.36)	\$13,996,081.63	\$12,596,473	(\$1,399,608)	\$48,217,682
	April	(\$8,639,622.84)	\$8,568,621.70	\$7,711,760	(\$856,862)	\$47,360,820
	May	\$47,707,704.62			\$5,139,180	\$52,500,000
	June	\$3,713,671.46				\$52,500,000
	July	(\$732,993.54)	\$724,530.44	\$652,077	(\$72,453)	\$52,427,547
2	August	(\$2,816,016.20)	\$2,779,866.49	\$1,959,806		
	September	(\$5,986,214.20)	\$5,903,497.88	\$4,161,966		
	October	(\$8,049,693.21)	\$7,930,578.28	\$5,591,058		
	November	\$24,131,838.28				
	December	(\$11,818,508.50)	\$11,615,346.67	\$8,188,819		
	January	(\$14,084,082.35)	\$13,827,863.69	\$9,748,644		
	February	(\$3,068,198.25)	\$3,007,817.97	\$2,120,512		
	March	(\$14,099,122.36)	\$13,807,209.12	\$9,734,082		
	April	(\$8,639,622.84)	\$8,451,898.98	\$5,958,589		
	May	\$47,707,704.62				
	June	\$3,713,671.46				
	July	(\$732,993.54)	\$714,372.32	\$503,632		
3	August	(\$2,816,016.20)	\$2,738,872.78	\$1,917,211		
	September	(\$5,986,214.20)	\$5,815,759.42	\$4,071,032		
	October	(\$8,049,693.21)	\$7,811,797.51	\$5,468,258		
	November	\$24,131,838.28				
	December	(\$11,818,508.50)	\$11,430,879.00	\$8,001,615		
	January	(\$14,084,082.35)	\$13,606,489.65	\$9,524,543		
	February	(\$3,068,198.25)	\$2,957,182.76	\$2,070,028		
	March	(\$14,099,122.36)	\$13,572,833.72	\$9,500,984		
	April	(\$8,639,622.84)	\$8,307,243.38	\$5,815,070		
	May	\$47,707,704.62				
	June	\$3,713,671.46				
	July	(\$732,993.54)	\$701,302.90	\$490,912		

Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis



Approaches for Determining Portfolio Duration

Cash Flow Based Approach

ALM Analysis

- Uses institution's actual cash flow data to measure future liabilities and derive duration needs
- Eliminates bias and idiosyncratic problems that public entities can have with market-based approaches (liquidity, sector and structure differences).
- Ensures each institution's duration is unique and not peer or market related.
- Places emphasis on timing and magnitude of investments relative to liabilities versus market-based optimizations for the masses.
- Does require more data and effort to establish the projected liability stream and involves calculations that may not be familiar.
- There are opportunity costs associated by limiting the investment universe to any particular timeframe, however it can be argued that maintaining a stable duration and limiting cash balances can more than offset any costs associated with security selection constraints (without this process, cash balances tend to be higher and more conservative securities are purchased due to uncertainty).

Disclosure

This presentation is for informational purposes only. All information is assumed to be correct, but the accuracy has not been confirmed and therefore is not guaranteed to be correct. Information is obtained from third party sources that may or may not be verified. The information presented should not be used in making any investment decisions and is not a recommendation to buy, sell, implement, or change any securities or investment strategy, function, or process.

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