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Liability Driven Investing

April 2025

Sage Advisory Services
5900 Southwest Parkway
Building 1, Suite 100
Austin, Texas 78735

SAGE | INVEST WITH WISDOM™

Who We Are

- Founded in 1996
- 100% employee operated
- 17-member investment team has an average industry experience of 18 years
- Deliver fixed income SMAs across the yield curve

Why Sage

Agility

Our size and independence as an employee-controlled firm enable us to take a nimble approach.

Alignment

We customize the investment experience to align with each client's unique objectives and needs.

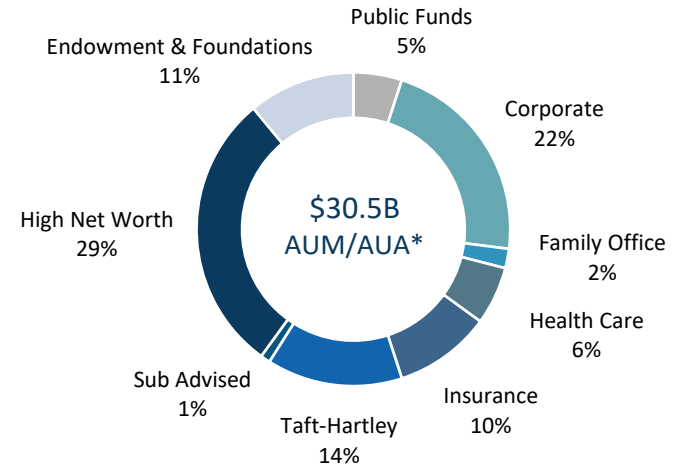
Consistency

We have a tenured investment team and proven process that enable us to deliver expected results.

Culture

We are committed to cultivating a culture of service and trust among our clients, our employees, and our community.

Who We Serve



Fixed Income Strategies

Strategies Across the Yield Curve*

Short Term	Intermediate	Core	Long/LDI	Credit	Municipal
Enhanced Cash	Moderate Term	Core Aggregate	LDI	Intermediate Corp	Muni Total Return
Short Term	Intermediate Term	Core Plus	Long Term	High Yield	Muni Ladder

Customization Options

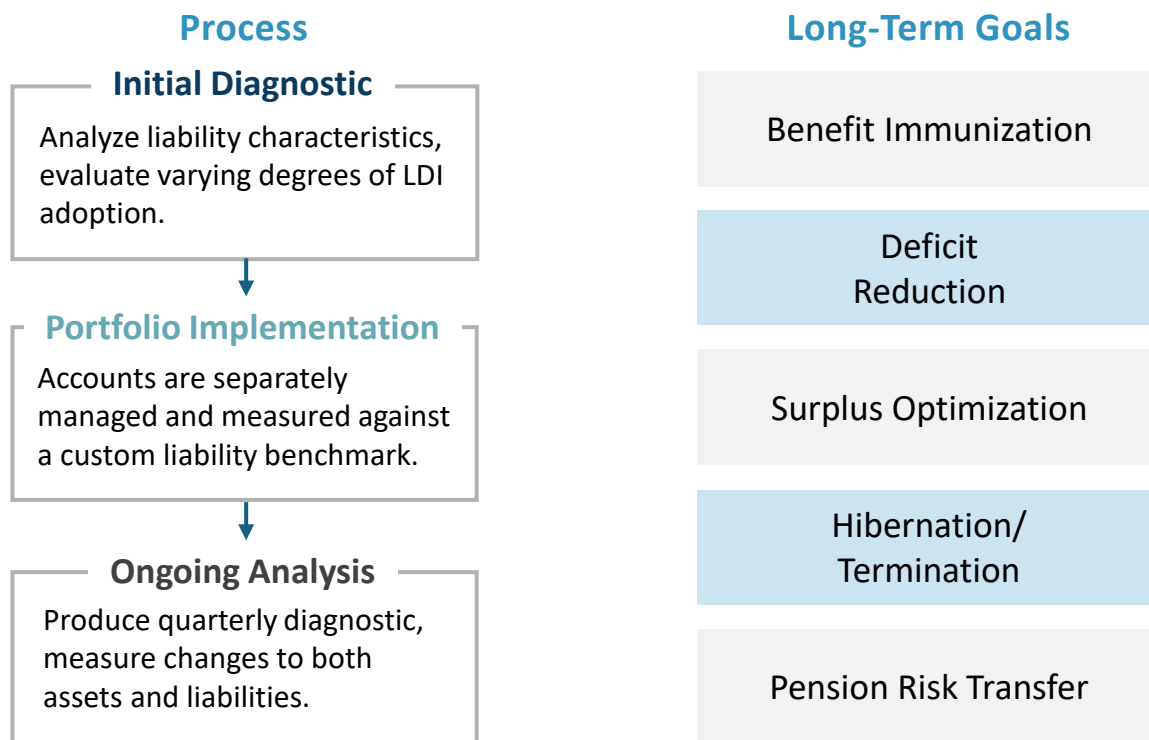
Client Application	Maturity/Duration	Credit Quality	Cash Flow Targeting	Responsible Investing
Customize to the unique purpose of asset pool Example Pension plan de-risking, insurance co. reserves, hospital operating pools	Target a max maturity, duration or ladder Example Maximum maturity of 5 years or duration of less than 1 year	Restrict, limit, expand ratings categories Example Allow allocation to below-IG bonds to enhance yield	Align portfolio with known liquidity needs Example Manage maturities and cash to fund quarterly distributions	Limit or exclude certain industries or securities Example Apply faith-based screens to a corporate bond allocation

*Not a complete list of strategies

Custom LDI Solutions

Our Approach

We start with the end in mind. The relationship between assets and liabilities is a key consideration of the planning process because ultimately, our liability-driven approach is about managing risk. Each account is customized and measured against a custom liability benchmark.



Sample Pension Plan Diagnostic: Asset/Liability Characteristics

The Sage team will produce an initial diagnostic to evaluate the relationship between plan assets and liabilities to understand important risk characteristics, such as the interest rate hedge ratio.

	Future Value	Discount Rate	Present Value	Surplus/ (Deficit)	Funded Status	Duration (Years)	Dollar Duration	IR Hedge Ratio
Assets								
Fixed Income Assets			84,908			6.2	5,264	
<u>Return Seeking Assets</u>			<u>127,362</u>			<u>N/A</u>	<u>N/A</u>	
Total Assets			212,270			2.5	5,264	
Liabilities								
PBO, IRS Corp Curve	424,875	4.9%	212,270	0	100%	11.5	24,441	22%

Sample Pension Plan Diagnostic: Interest Rate Sensitivities and Hedge Ratios

The analysis evaluates the potential funded status volatility of the current allocation while comparing the same risk metrics for portfolios that introduce varying allocations to LDI.

	Current Portfolio: 40% FI / 60% Return-Seeking	Portfolio 2: 75% LDI / 25% Return-Seeking
Liability Profile		
Present Value	212,270	212,270
Duration (Total)	11.5	11.5
Asset Profile		
Total Assets	212,270	212,270
Fixed Income Allocation	40%	75%
Return-Seeking Allocation	60%	25%
Fixed Income Duration	6.2	11.5
Risk Profile		
Funded Status	100%	100%
Surplus/(Deficit)	0	0
Portfolio IR Hedge Ratio	22%	75%
% Funded Status Vol	10.0%	4.4%
\$ Funded Status Vol	21,823	9,506

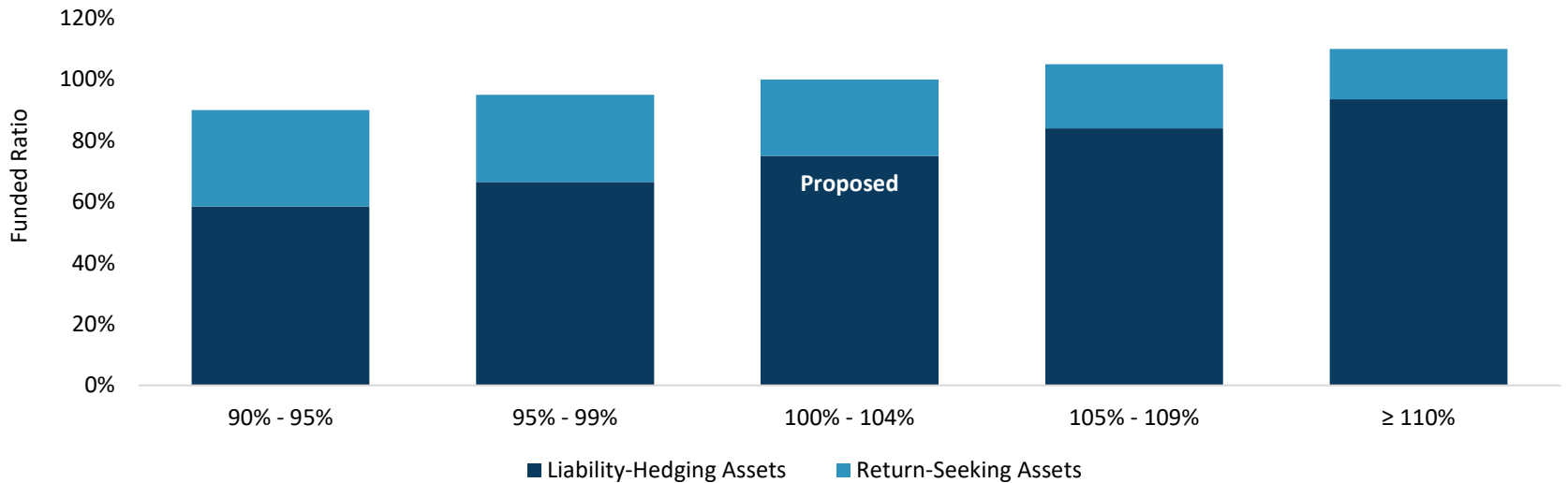
Sample Pension Plan Diagnostic: Capital Market Scenario Analysis

In addition to utilizing stochastic modeling to understand statistical risk, we model the potential impact of an instantaneous shift in interest rates and return-seeking assets.

Current Allocation						75% LDI / 25% Return-Seeking							
Plan Funded Status Resulting From Market Movements						Plan Funded Status Resulting From Market Movements							
		Interest Rate Shift							Interest Rate Shift				
		-2.0%	-1.0%	0.0%	+1.0%	+2.0%			-2.0%	-1.0%	0.0%	+1.0%	+2.0%
Return-Seeking Change	-20%	73.4%	80.5%	88.0%	95.6%	102.9%	Return-Seeking Change	-20%	90.7%	92.8%	95.0%	97.3%	99.6%
	-10%	78.1%	85.8%	94.0%	102.3%	110.3%		-10%	92.7%	95.0%	97.5%	100.1%	102.7%
	0%	82.9%	91.1%	100.0%	109.0%	117.7%		0%	94.7%	97.2%	100.0%	102.9%	105.8%
	+10%	87.6%	96.5%	106.0%	115.7%	125.1%		+10%	96.6%	99.4%	102.5%	105.7%	108.9%
	+20%	92.3%	101.8%	112.0%	122.4%	132.4%		+20%	98.6%	101.7%	105.0%	108.5%	112.0%

Sample Pension Plan Diagnostic: De-Risking Glidepath

Develop and adopt a custom de-risking glidepath that will trigger an increase to the liability hedging portfolio as funded-status milestones are achieved.



	CURRENT	→ GLIDEPATH BY FUNDED RATIO →				TARGET
	100%	90% - 95%	95% - 99%	100% - 104%	105% - 109%	≥ 110%
Asset Allocation						
Liability-Hedging Assets	40%	65% - 70%	70% - 75%	75% - 80%	80% - 85%	85% - 100%
Return-Seeking Assets	60%	30% - 35%	25% - 30%	20% - 25%	15% - 20%	0% - 15%
Risk Profile						
Portfolio IR Hedge Ratio	22%	59%	67%	75%	84%	94%

Our Approach

Custom Liability Benchmark Construction

Sage develops a custom liability benchmark (CLB) for all LDI clients based on the client's existing pension liabilities. The CLB measures the change in liabilities and provides the framework for portfolio construction.

Liability Analysis

- Liabilities discounted with published discount curves (i.e. IRS, FTSE).
- Published yield curves are non-investable.
- Output is liability characteristics including key-rate duration and single-equivalent discount rate.



Sage CLB Methodology

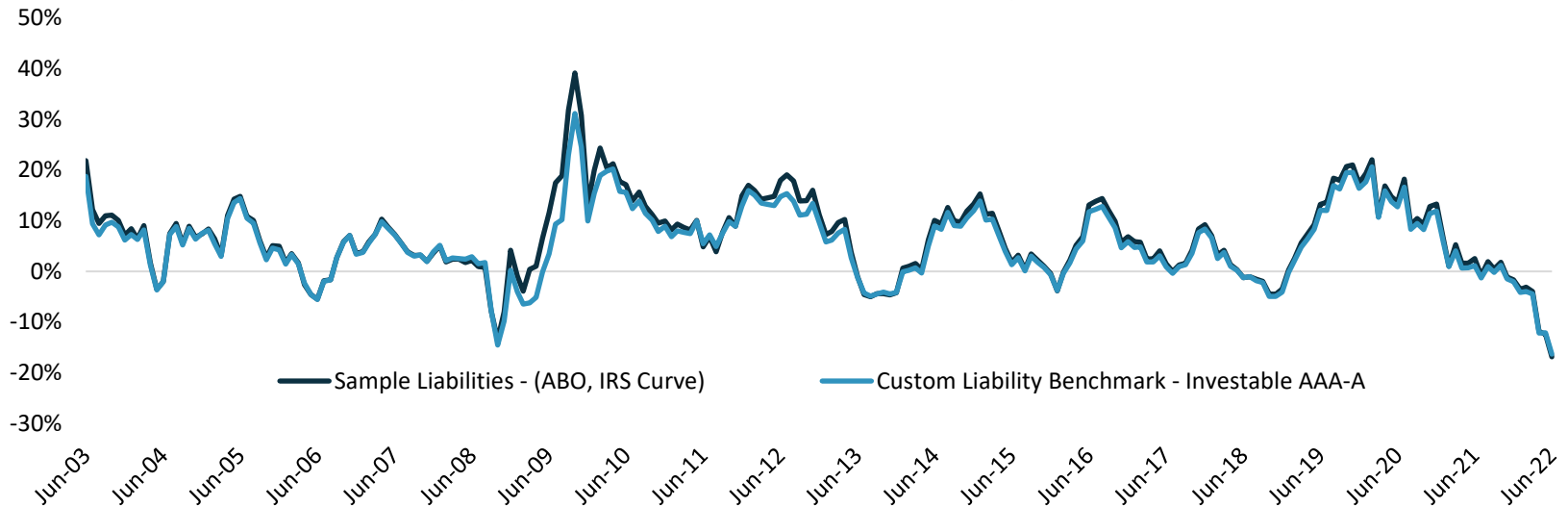
- Translate liability characteristics into a benchmark of investable bonds.
- Investable universe comprised of over 9,000 constituents.
- Output is a liability benchmark with sector, quality, duration, and maturity distribution.

Our Approach

Benefits of Custom Liability Benchmark



Sample Liabilities vs Investable CLB: Rolling 1-YR Returns

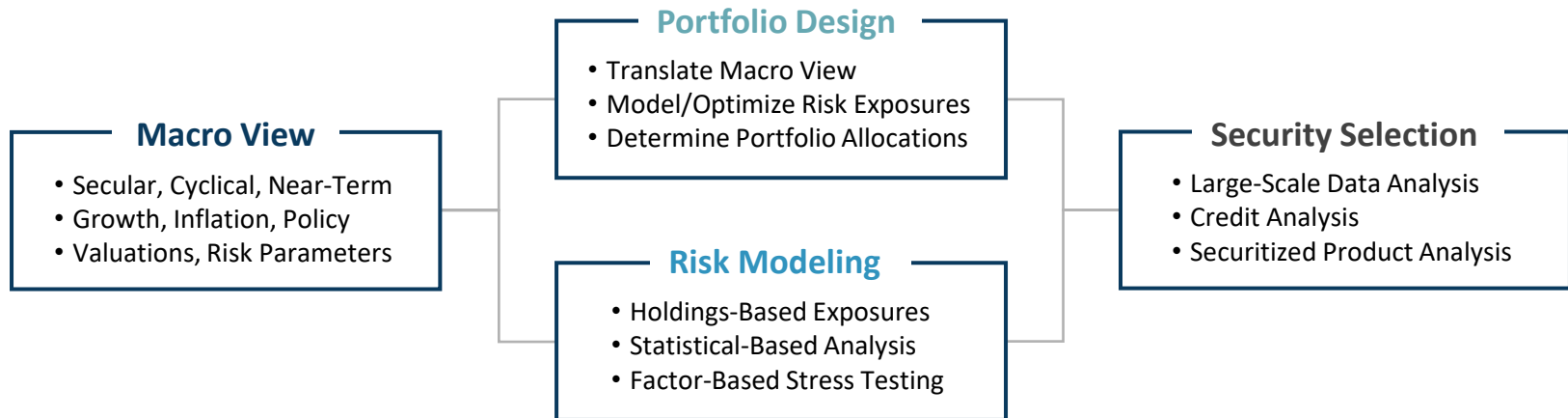


Sample liabilities are for illustrative purposes.

Our Approach

Investment Process

Our teams work together to balance the development of our macro views with thoughtful portfolio design, value-driven security selection, and active risk management.



Sample Pension Plan: Portfolio Characteristics vs. CLB

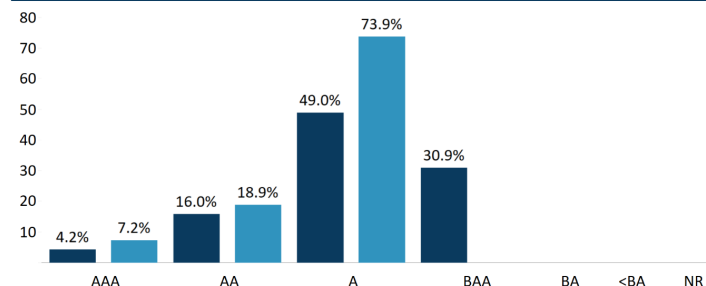
PORTFOLIO SUMMARY

As of Date	September 30, 2024
Portfolio Market Value	\$190,027,529
Number of Securities	197
Benchmark	CLB Investable

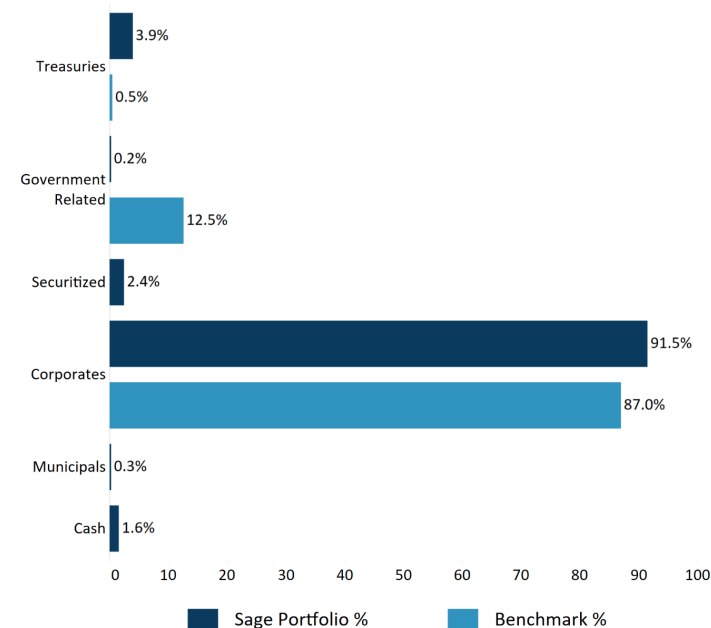
PORTFOLIO CHARACTERISTICS

	Portfolio	Benchmark
Yield to Worst	4.96%	4.84%
Coupon	4.39%	4.26%
Effective Maturity	20.69	19.73
Effective Duration	11.67	11.57
Average Credit Rating	A	A+

CREDIT RATING ALLOCATION

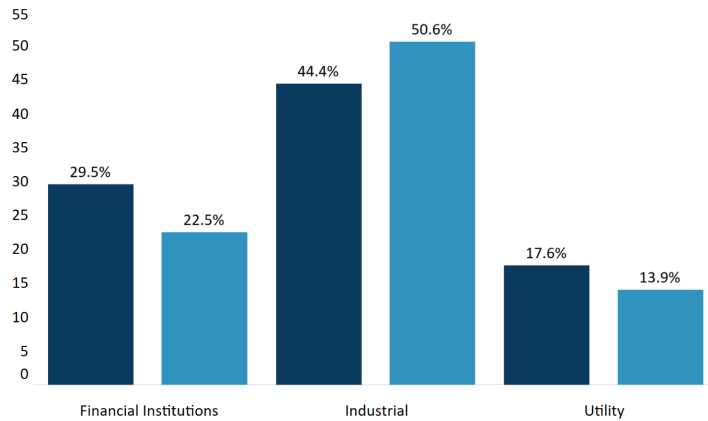


SECTOR ALLOCATION

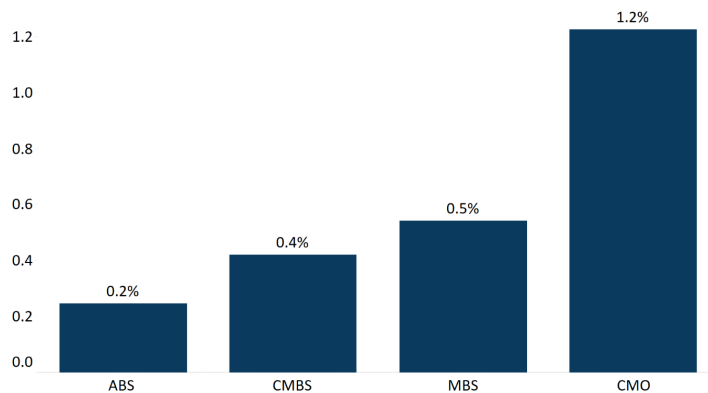


Sample Pension Plan: Portfolio Characteristics vs. CLB

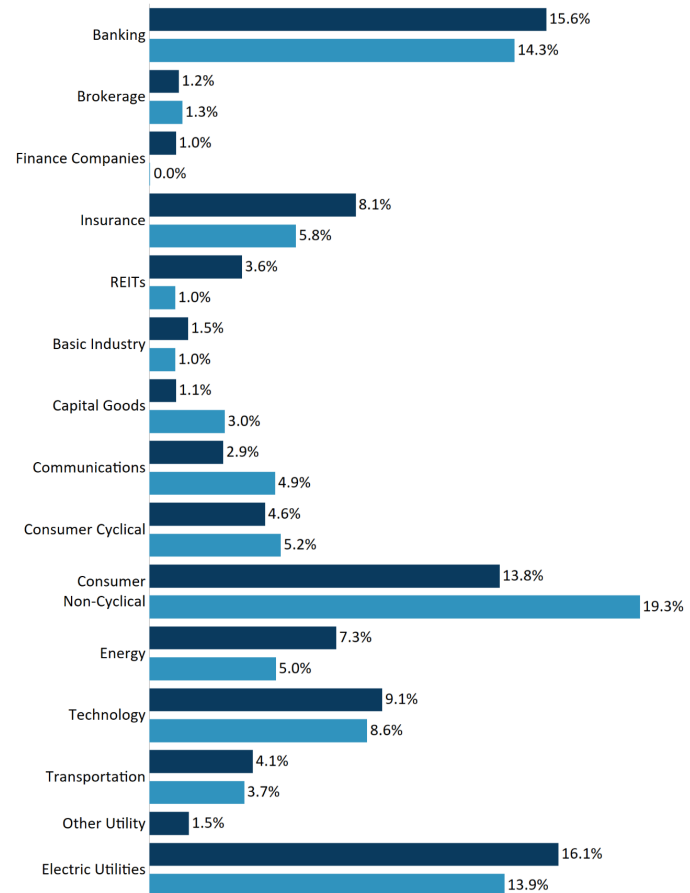
CORPORATE SECTOR ALLOCATION




SECURITIZED SECTOR ALLOCATION




CORPORATE INDUSTRY ALLOCATION



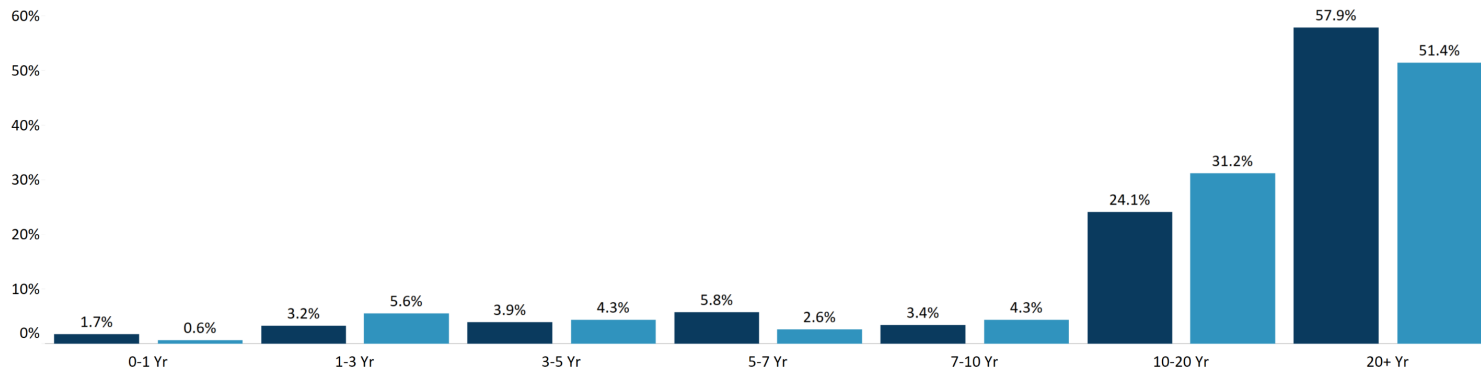
Sample portfolio characteristics are for illustrative purposes.

 Sage Portfolio %

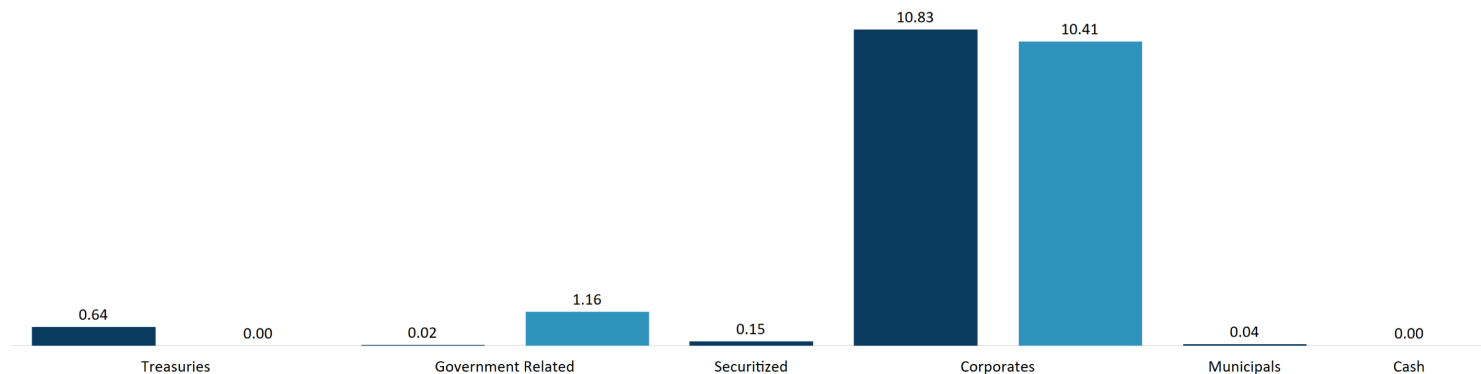
 Benchmark %

Sample Pension Plan: Portfolio Characteristics vs. CLB

MARKET VALUE DISTRIBUTION BY MATURITY



CONTRIBUTION TO DURATION DISTRIBUTION BY SECTOR



 Sage Portfolio %
  Benchmark %

Sample portfolio characteristics are for illustrative purposes.

Sample Pension Plan: Quarterly Diagnostic

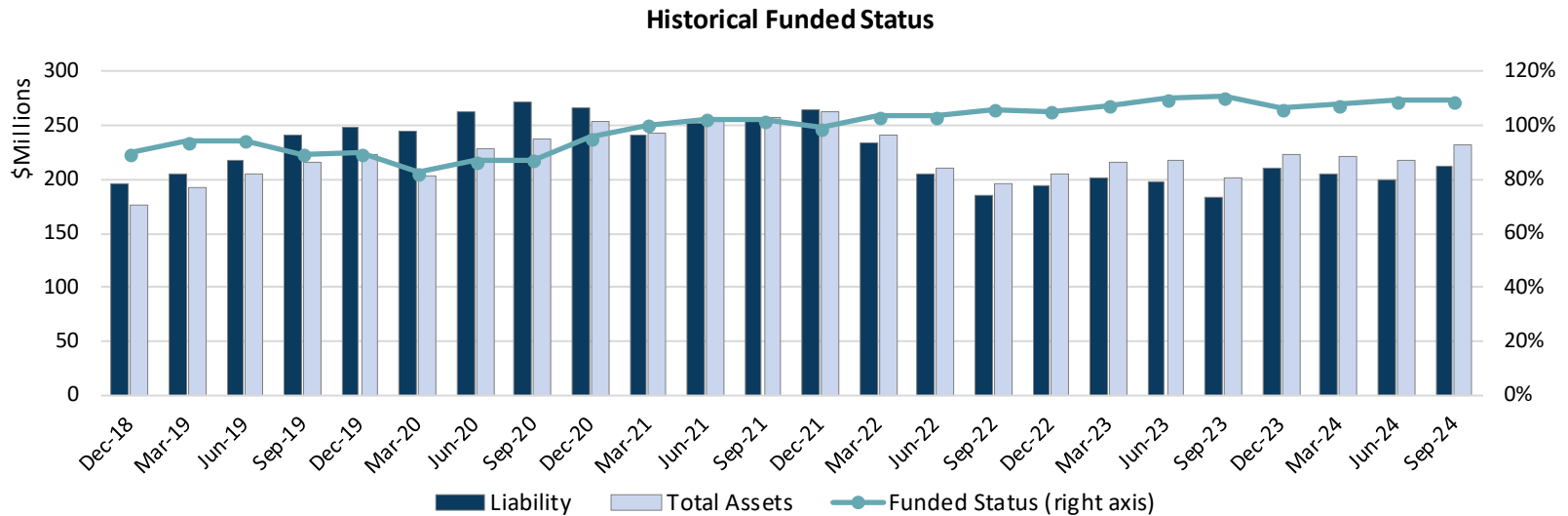
Each LDI portfolio receives a quarterly diagnostic that estimates changes to plan health, the single-equivalent discount rate, and key risk characteristics.

Key Characteristics	12/31/2023	3/31/2024	6/30/2024	9/30/2024
Plan Status				
Closed to new participants effective 4/28/2004				
Assets				
Total Plan Assets	222,879	221,485	218,284	231,768
Fixed Income LDI Market Value	181,331	178,927	176,322	190,028
Fixed Income LDI Allocation %	81%	81%	81%	82%
Liabilities - PBO, IRS Corp Curve (EOM)				
Present Value of Liabilities	210,025	205,328	200,253	212,270
Discount Rate	5.0%	5.2%	5.4%	4.9%
Funded Status	106%	108%	109%	109%
Interest Rate Sensitivities				
LDI Assets Duration (Years)	12.0	11.9	11.5	11.7
Liability Duration (Years)	12.0	11.7	11.3	11.5
Hedge Ratio	87%	89%	89%	91%

Sample Pension Plan: Quarterly Diagnostic

The Sage team evaluates the performance of the LDI portfolio vs. the change in the custom liability benchmark (CLB), along with a historical change in funded status since the inception of the account.

	QTD	YTD	1 Year	3 Year	5 Year	Inception	Std Dev
Fixed Income LDI Assets	7.8%	4.8%	17.7%	-4.2%	0.0%	3.9%	13.0%
CLB Investable	7.6%	4.1%	16.8%	-4.7%	-0.9%	2.9%	12.0%
Excess	0.2%	0.7%	0.9%	0.5%	0.9%	1.1%	0.9%



IMPORTANT DISCLOSURES

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