



# MIDLAND FIREMEN'S RELIEF & RETIREMENT FUND



## ASSET ALLOCATION STUDY

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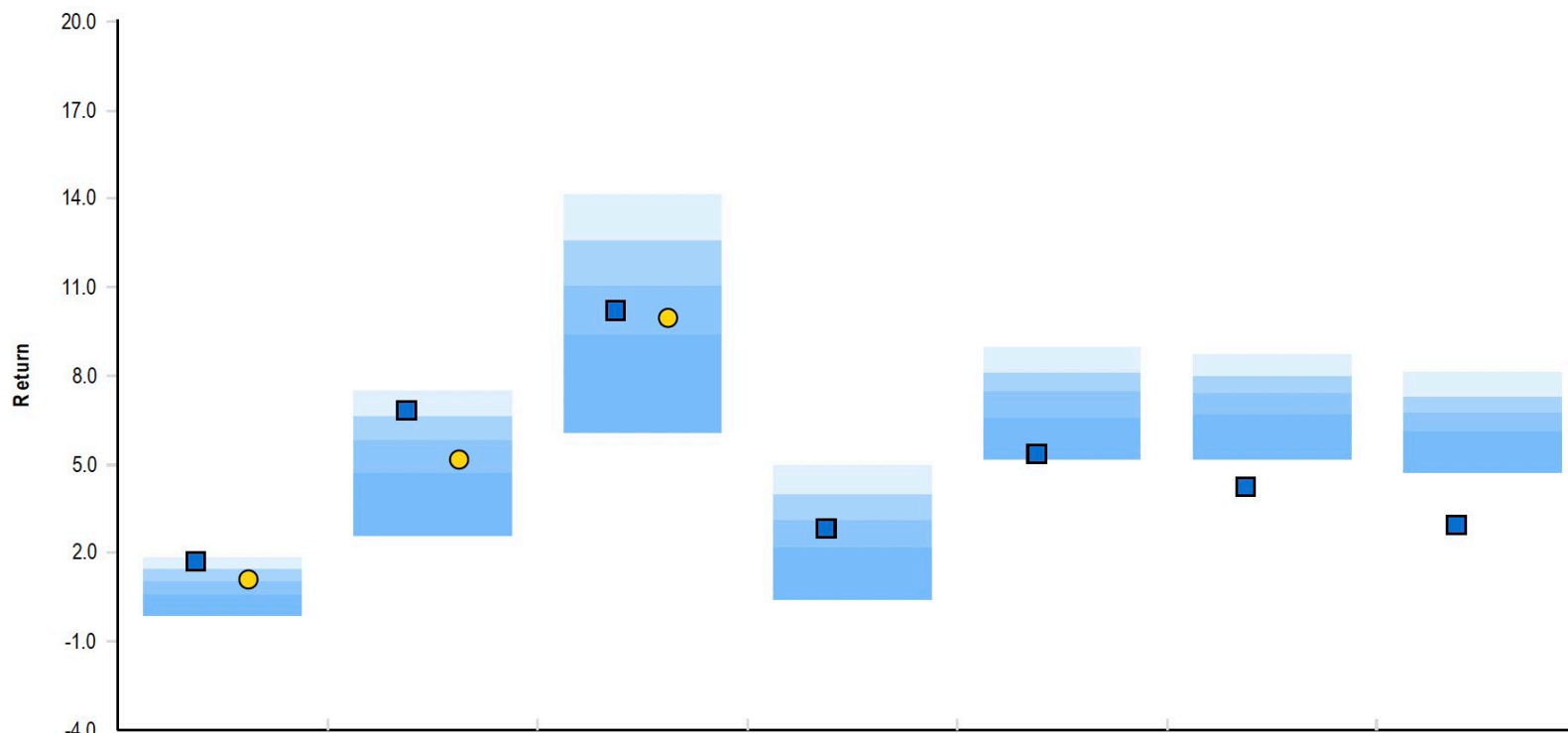
# Purpose

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- Is the 7.0% goal return achievable?
- Is the IPS target allocation appropriate?
- Portfolio optimization - Can the investment portfolio be more efficient?
- Stress testing and loss evaluation - Are the risks acceptable?
- Are there additional asset classes to consider?

# Past Performance

MFRRF vs All Public DB Plans : June 30, 2024



	1 QTR	Fiscal YTD	1 Year	3 Years	5 Years	7 Years	10 Years
■ Total Fund	1.71 (8)	6.85 (20)	10.23 (65)	2.81 (59)	5.38 (95)	4.25 (98)	2.98 (99)
● Target Index <sup>1</sup>	1.11 (48)	5.18 (65)	9.98 (69)	N/A	N/A	N/A	N/A
5th Percentile	1.85	7.49	14.16	5.01	8.98	8.72	8.10
1st Quartile	1.46	6.66	12.63	3.97	8.11	8.02	7.34
Median	1.06	5.86	11.07	3.13	7.49	7.46	6.77
3rd Quartile	0.64	4.77	9.41	2.24	6.61	6.73	6.13
95th Percentile	-0.09	2.59	6.12	0.40	5.15	5.17	4.72



# Current Target Index

## *Compared to IPS / Compared to Public Funds Nationally*

- IPS target mix (50% equity exposure):
  - Target - 20% R1000/ 5% R2500 / 15 % MSCI EAFE / 10% Alerian MLP Index / 10% NCREIF ODCE / 15% Bloomberg US Agg. / 20% CPI+3% / 5% T-Bills
  - Max equity exposure = **70%**
- Investment Metrics – All Public Defined Benefit Plans 2024
  - **59.4%** Median allocation to Total Equity
  - **45.0%** Median Allocation to US Equity
  - **14.5%** Median Allocation to INTL Equity
  - **22.7%** Median allocation to Fixed Income

\*MFRRF = 50.3%

\*MFRRF = 37.6%

\*MFRRF = 12.7%

\*MFRRF = 21.1%

*\*Based on MFRRF actual allocations as of 6/30/2024.*



# Capital Market Assumptions

2023 Survey Participants	
<i>AJ Gallagher</i>	<i>Merrill</i>
<i>Alan Biller</i>	<i>Milliman</i>
<i>AndCo Consulting</i>	<i>Morgan Stanley</i>
<i>Aon</i>	<i>NEPC</i>
<i>The Atlanta Consulting Group</i>	<i>PFM Asset Management, LLC</i>
<i>Bank of New York Mellon*</i>	<i>PIMCO</i>
<i>BlackRock*</i>	<i>Principal</i>
<i>Buck</i>	<i>Research Affiliates, LLC*</i>
<i>Callan Associates</i>	<i>Royal Bank of Canada</i>
<i>Cambridge Associates</i>	<i>RVK</i>
<i>CapTrust</i>	<i>Segal Marco Advisors</i>
<i>Investnet</i>	<i>SEI</i>
<i>Goldman Sachs Asset Management</i>	<i>Sellwood Consulting</i>
<i>Graystone Consulting</i>	<i>Sterling Capital Management, LLC</i>
<i>Invesco*</i>	<i>Truist Investment Advisory</i>
<i>Investment Performance Services, LLC (IPS)</i>	<i>UBS</i>
<i>Janney Montgomery Scott, LLC</i>	<i>The Vanguard Group</i>
	<i>Verus</i>
<i>J.P. Morgan Asset Management*</i>	<i>Voya Investment Management*</i>
<i>Marquette Associates</i>	<i>Willis Towers Watson</i>
<i>Meketa Investment Group</i>	<i>Wilshire</i>
<i>Mercer</i>	

## Capital Market Assumptions

- For this study we have adopted the 2023 Horizon survey
- 27 models using long-term (20yr) time horizon
- Using a “hypothetical portfolio,” the survey shows a 49% probability of achieving a 7.0% return.

### Horizon Actuarial 2023 Survey of Capital Market Assumptions

#### Average Survey Assumptions

Asset Class	Expected Returns				Standard Deviation
	10-Year Horizon		20-Year Horizon		
	Arith.	Geom.	Arith.	Geom.	
1 US Equity - Large Cap	8.19%	6.90%	8.67%	7.37%	16.64%
2 US Equity - Small/Mid Cap	9.33%	7.38%	9.72%	7.75%	20.51%
3 Non-US Equity - Developed	9.05%	7.49%	9.38%	7.78%	18.26%
4 Non-US Equity - Emerging	10.86%	8.21%	11.39%	8.59%	23.87%
5 US Corporate Bonds - Core	4.88%	4.71%	4.93%	4.76%	5.85%
6 US Corporate Bonds - Long Duration	5.38%	4.80%	5.56%	5.00%	10.91%
7 US Corporate Bonds - High Yield	6.91%	6.43%	7.03%	6.54%	10.01%
8 Non-US Debt - Developed	3.71%	3.42%	3.81%	3.52%	7.31%
9 Non-US Debt - Emerging	6.86%	6.29%	7.00%	6.40%	10.93%
10 US Treasuries (Cash Equivalents)	3.39%	3.38%	3.23%	3.23%	1.09%
11 TIPS (Inflation-Protected)	4.27%	4.07%	4.29%	4.08%	6.17%
12 Real Estate	7.34%	5.95%	7.48%	6.25%	16.72%
13 Hedge Funds	6.29%	5.96%	6.54%	6.18%	8.06%
14 Commodities	6.53%	4.96%	6.55%	4.90%	18.02%
15 Infrastructure	8.56%	7.00%	8.38%	7.06%	17.10%
16 Private Equity	11.92%	9.46%	12.77%	10.13%	22.57%
17 Private Debt	8.84%	8.16%	8.89%	8.24%	11.73%
Inflation	2.56%	2.55%	2.47%	2.46%	1.90%



## Capital Market Assumptions 2024

Midland Firemen's Relief & Retirement Fund

2024 Capital Market Assumptions - Based on the 2023 Horizon Survey

<u>Asset Class</u>	<u>Expected LT Total Annualized Return</u>	<u>Inflation Assumption</u>	<u>Expected LT Real Return</u>	<u>Target Allocation</u>	<u>Return Contribution</u>
US Large Cap Equity	7.37	2.46	4.91	20%	0.98
US Small / Mid Cap Equity	7.75	2.46	5.29	5%	0.26
International Equity	7.78	2.46	5.32	15%	0.80
Emerging Markets Equity	8.59	2.46	6.13	0%	0.00
Master Limited Partnership	7.60	2.46	5.14	10%	0.51
U.S. Direct Real Estate	6.25	2.46	3.79	10%	0.38
Absolute Return	6.18	2.46	3.72	0%	0.00
Global Infrastructure	7.06	2.46	4.60	0%	0.00
Prefds/Converts	5.46	2.46	3.00	0%	0.00
Private Equity	10.13	2.46	7.67	15%	1.15
Private Debt	8.24	2.46	5.78	5%	0.29
US High Yield	6.54	2.46	4.08	0%	0.00
US Fixed Income	4.76	2.46	2.30	15%	0.35
US Cash & Equiv	3.23	2.46	0.77	5%	0.04
Total				100%	

Total Expected Real Return (net of Inflation)	4.76
Long-term Inflation Assumption	2.46
<b>Total Expected Return (including Inflation)</b>	<b>7.22</b>

- Capital Market Assumptions do not consider plan maturity, liabilities or cash flows.
- MLP - Source Morgan Stanley Capital Market Assumptions, 3/27/24



# Forecasting Constraints

## Mean Variance Optimization – IPS Model Constraints

Asset Class	Min	Max	Current
Large Cap Equity	10%	35%	20%
SMID Cap Equity	0%	20%	5%
Intl Equity	5%	20%	15%
MLP	0%	15%	10%
US Fixed Inc	5%	25%	15%
Real Estate	5%	15%	10%
Cash	0%	15%	5%
Private Equity / Venture Capital	5%	20%	15%
Private Credit	0%	15%	5%
Total			100.0%
<b>Model Constraints:</b>			
Domestic Equity (LC, SMID)	10%	55%	
International Equity (IE)	5%	20%	
Total Equity (LC, SMID, IE, MLP)	15%	70%	
ALTS (PE, PC, RE)	5%	35%	
Risk Free Rate:	4.0%		
Market Return:	7.0%		
Inflation Rate:	2.46%		
Investment Horizon:	30 yrs		
Portfolio Size	\$90M		

- The ranges shown for each asset class are those recommended in the new IPS.
- The model constraints are from the IPS, specifically 70% max in public equity.
- Given these constraints, the model will identify the most efficient portfolios, given varying levels of risk.



# Portfolio Modeling

## Correlation Matrix

Display Name	Large Cap Eq	SMID Cap Eq	Intl Equity	MLP	Private Equity	Real Estate	Private Credit	US Fixed Inc	US T-Bill
Large Cap Eq	1.00								
SMID Cap Eq	0.89	1.00							
Intl Equity	0.81	0.77	1.00						
MLP	0.62	0.67	0.43	1.00					
Private Equity	0.73	0.71	0.66	0.56	1.00				
Real Estate	0.56	0.55	0.50	0.86	0.45	1.00			
Private Credit	0.51	0.52	0.49	0.47	0.54	0.35	1.00		
US Fixed Inc	0.26	0.22	0.24	0.23	0.16	0.25	0.14	1.00	
US T-Bill	-0.06	-0.07	-0.05	-0.03	-0.07	-0.01	-0.07	0.16	1.00

\* MLP - Source Morgan Stanley Capital Market Assumptions, 3/27/24



# Portfolio Modeling

## Expected Return and Risk

Asset Class	Return <sup>1</sup>	Risk <sup>2</sup>
Large Cap Equity	7.37%	16.64%
SMID Cap Equity	7.75%	20.51%
Intl Equity	7.78%	18.26%
MLP	7.60%	17.40%
Private Equity	10.13%	22.57%
Real Estate	6.25%	16.72%
Private Credit	8.24%	11.73%
US Fixed Income	4.76%	5.85%
Cash	3.23%	1.09%

Portfolio Mix	Return <sup>1</sup>	Risk <sup>2</sup>
Current	7.22%	12.39%
OP 1	6.24%	8.29%
OP 2	6.83%	9.48%
OP 3	7.02%	10.10%
OP 4	7.22%	10.73%
OP 5	7.41%	11.49%
OP 6	7.61%	12.45%
OP 7	7.80%	13.45%
OP 8	8.00%	14.88%

<sup>1</sup>Expected Annualized Return

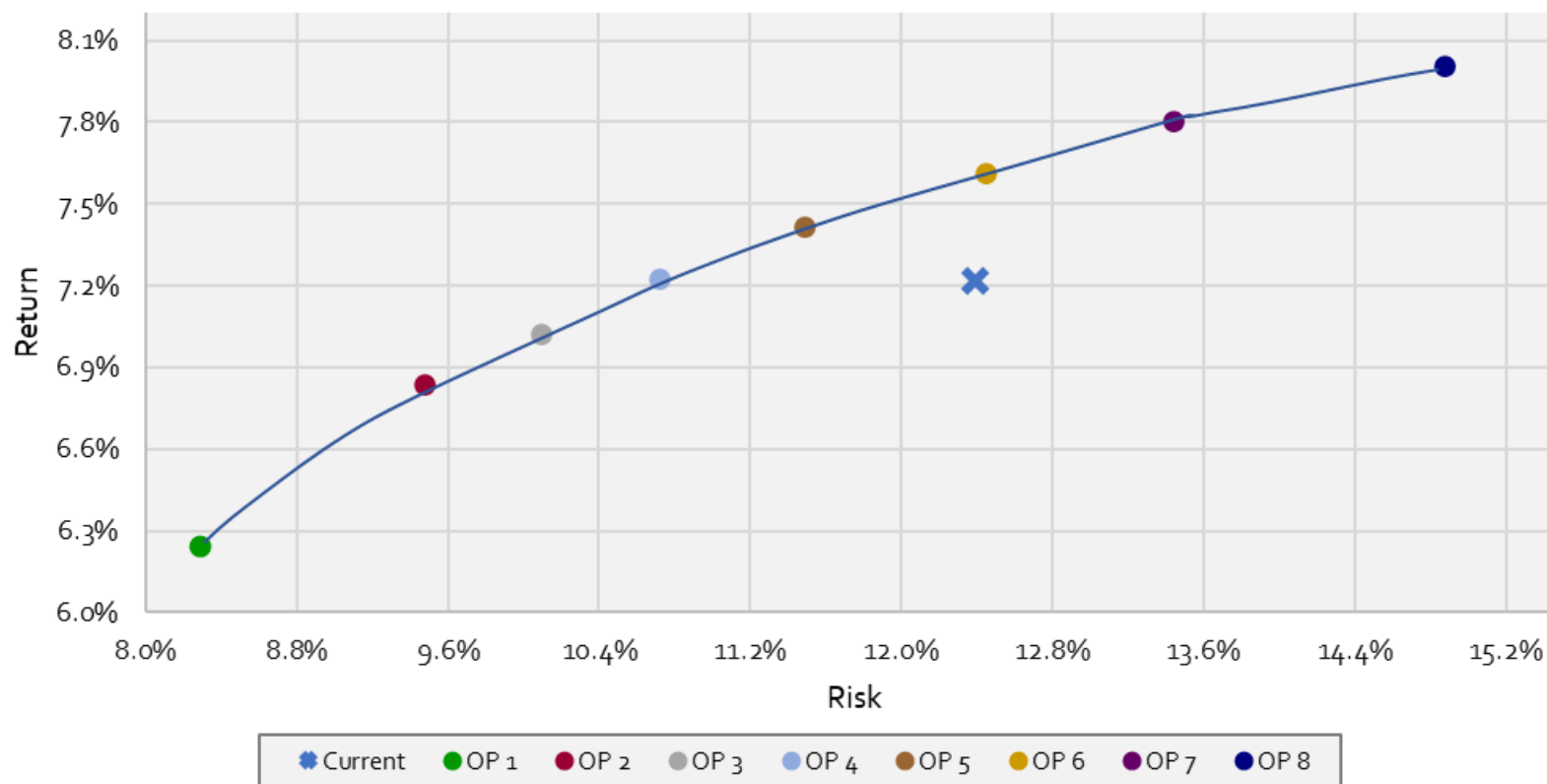
<sup>2</sup>Expected annualized standard deviations

\* MLP - Source Morgan Stanley Capital Market Assumptions, 3/27/24



# Efficient Frontier

Mean-Variance Optimization – Expected return and risk of the optimized portfolios are plotted below, along with a curve called the efficient frontier; which represents a continuum of alternative portfolios offering the highest expected return for a given level of risk.



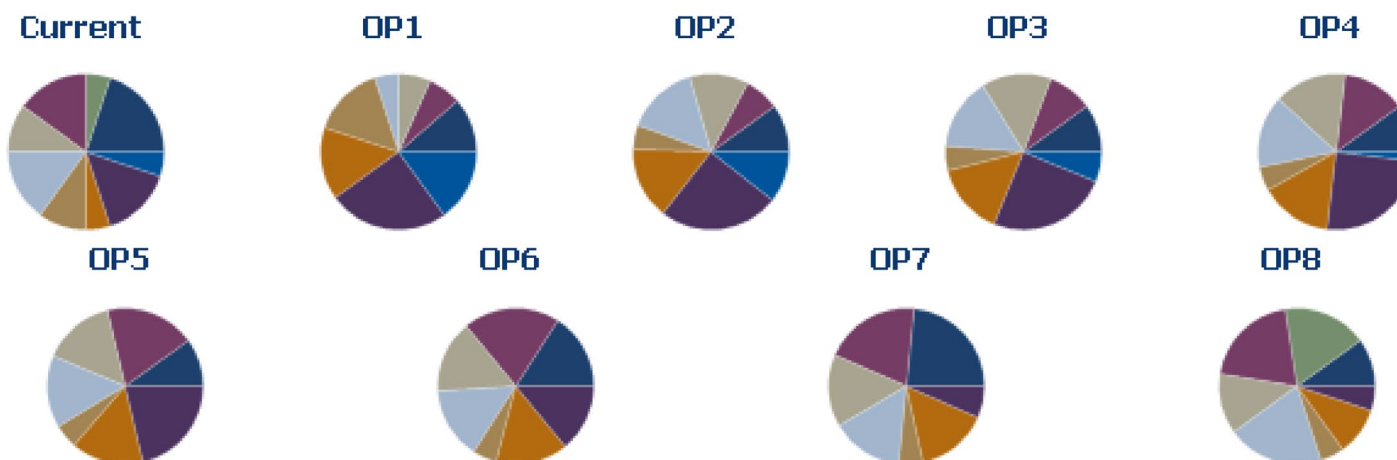
	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
Return <sup>1</sup>	7.22%	6.24%	6.83%	7.02%	7.22%	7.41%	7.61%	7.80%	8.00%
Risk <sup>2</sup>	12.39%	8.29%	9.48%	10.10%	10.73%	11.49%	12.45%	13.45%	14.88%

<sup>1</sup>Expected Annualized Return

<sup>2</sup>Expected annualized standard deviations



# Optimized Portfolios



Display Name	Current	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8
● Large Cap Eq	20.00%	11.43%	10.00%	10.00%	10.00%	10.00%	15.97%	23.46%	10.00%
● SMID Cap Eq	5.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	17.48%
● Intl Eq	15.00%	6.92%	7.23%	9.34%	13.15%	18.69%	20.00%	20.00%	20.00%
● MLP	10.00%	6.65%	12.22%	14.49%	15.00%	15.00%	15.00%	15.00%	12.52%
● Private Equity	15.00%	5.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	20.00%
● Real Estate	10.00%	15.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
● Private Credit	5.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	10.00%
● US Fixed Inc	15.00%	25.00%	25.00%	25.00%	25.00%	21.31%	14.03%	6.54%	5.00%
● Cash	5.00%	15.00%	10.55%	6.16%	1.85%	0.00%	0.00%	0.00%	0.00%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Return<sup>1</sup></b>	7.22%	6.24%	6.83%	7.02%	7.22%	7.41%	7.61%	7.80%	8.00%
<b>Risk<sup>2</sup></b>	12.39%	8.29%	9.48%	10.10%	10.73%	11.49%	12.45%	13.45%	14.89%
<b>Return/Risk Ratio</b>	0.58	0.75	0.72	0.70	0.67	0.64	0.61	0.58	0.54

Portfolio Value = \$90,000,000

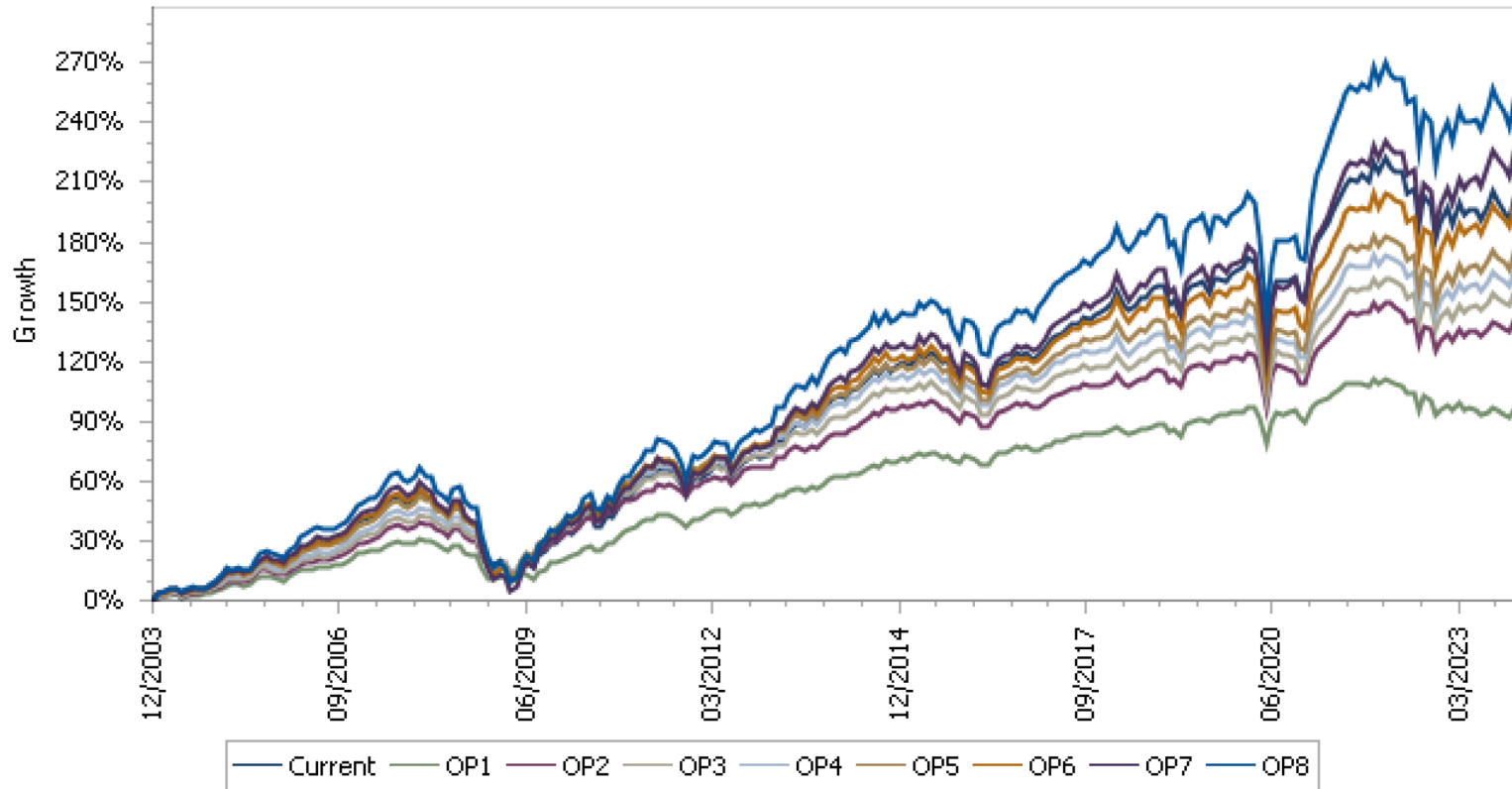
<sup>1</sup>Expected Annualized Return

<sup>2</sup>Expected annualized standard deviations



# Historical Performance - Cumulative Growth

Cumulative growth shows the cumulative percentage change in value of the portfolio from 12/2003 through 12/2023.



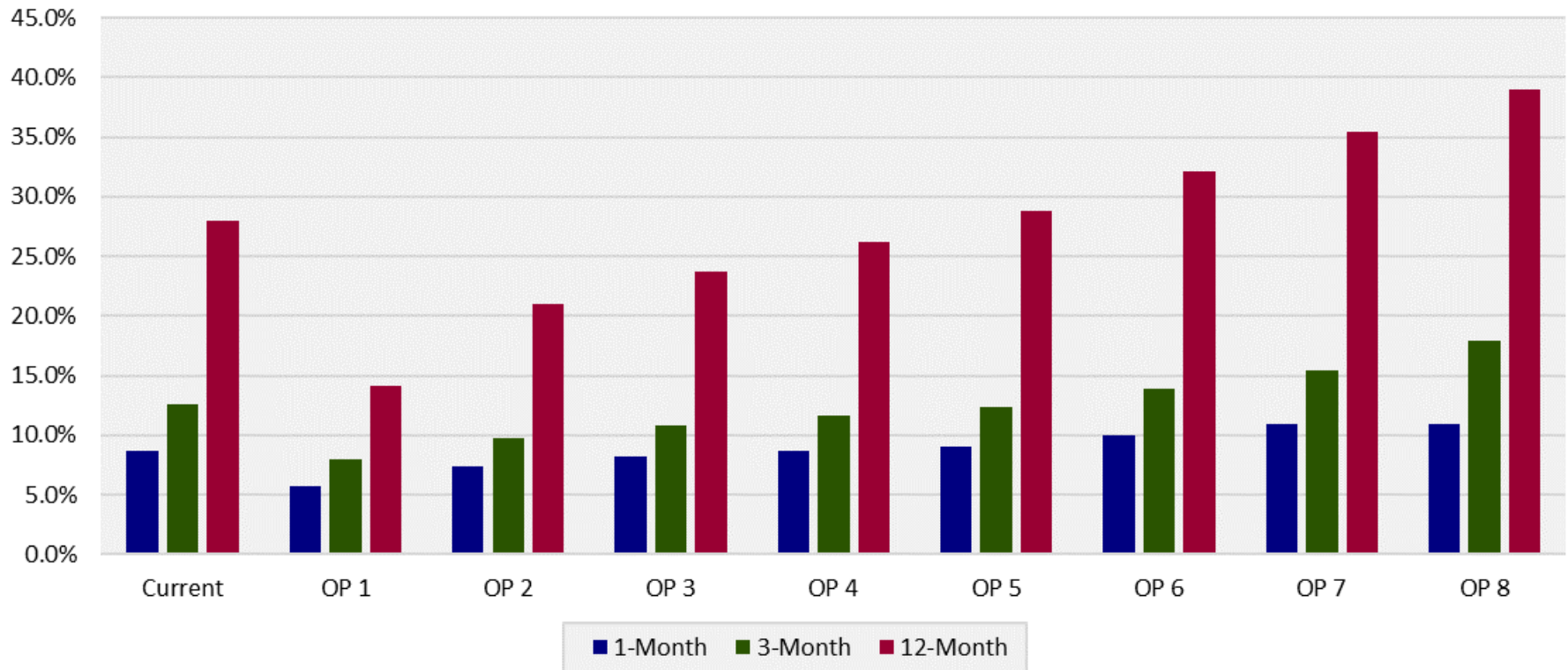
Historical Performance (12/2003- 12/2023)

	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
Cumulative Return	214.16%	101.81%	147.94%	162.61%	174.59%	185.33%	209.17%	237.89%	269.21%
Annualized Return	5.87%	3.58%	4.63%	4.92%	5.16%	5.36%	5.78%	6.25%	6.72%
Annualized Risk	8.58%	5.02%	6.10%	6.86%	7.52%	8.30%	9.30%	10.37%	10.91%



# Historical Performance - Best Periods

The best performance over any rolling 1, 3, or 12 month period throughout the historical period.



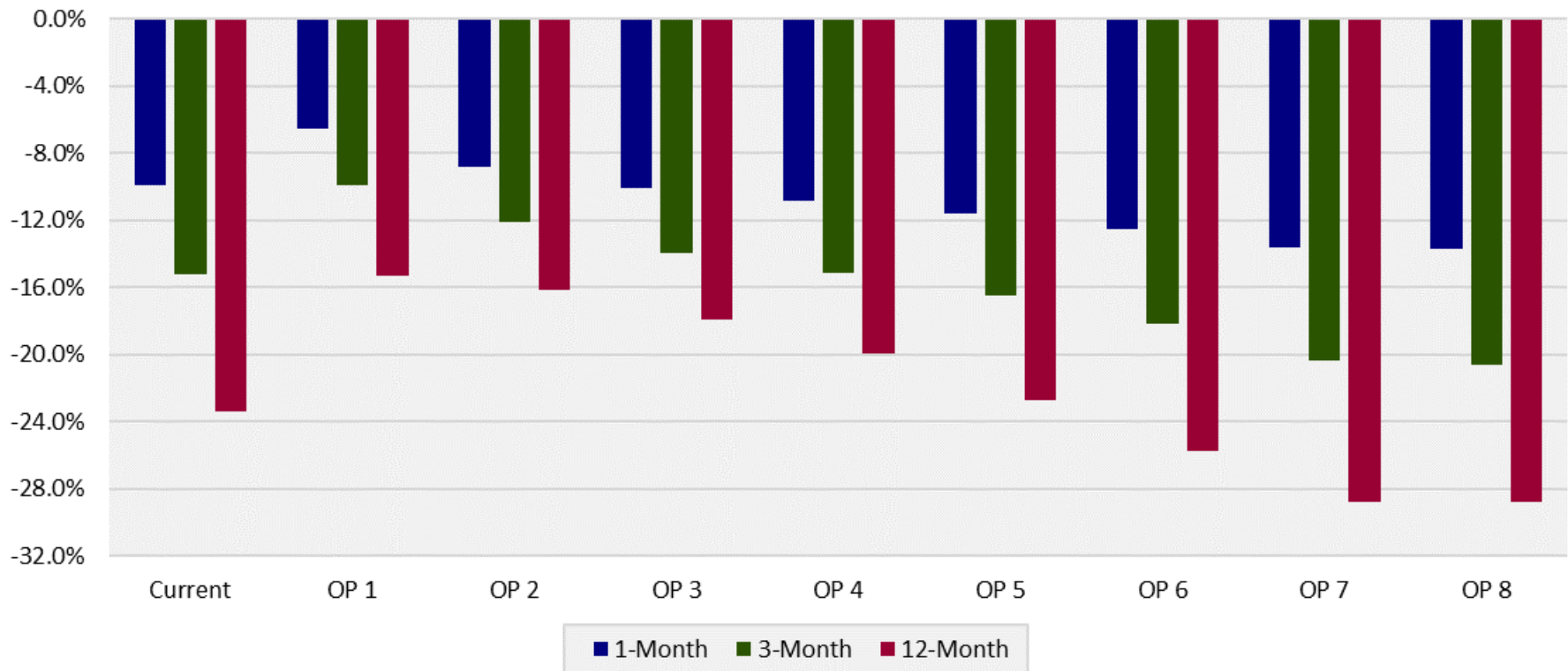
Best Periods (12/2003 - 12/2023)

	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
1-Month	8.73%	5.68%	7.41%	8.26%	8.72%	9.09%	9.95%	10.95%	10.99%
3-Month	12.57%	7.94%	9.74%	10.81%	11.60%	12.40%	13.84%	15.46%	17.97%
12-Month	27.93%	14.09%	21.04%	23.76%	26.14%	28.84%	32.07%	35.42%	39.02%



# Historical Performance - Worst Periods

The worst performance over any rolling 1, 3, or 12 month period throughout the historical period.



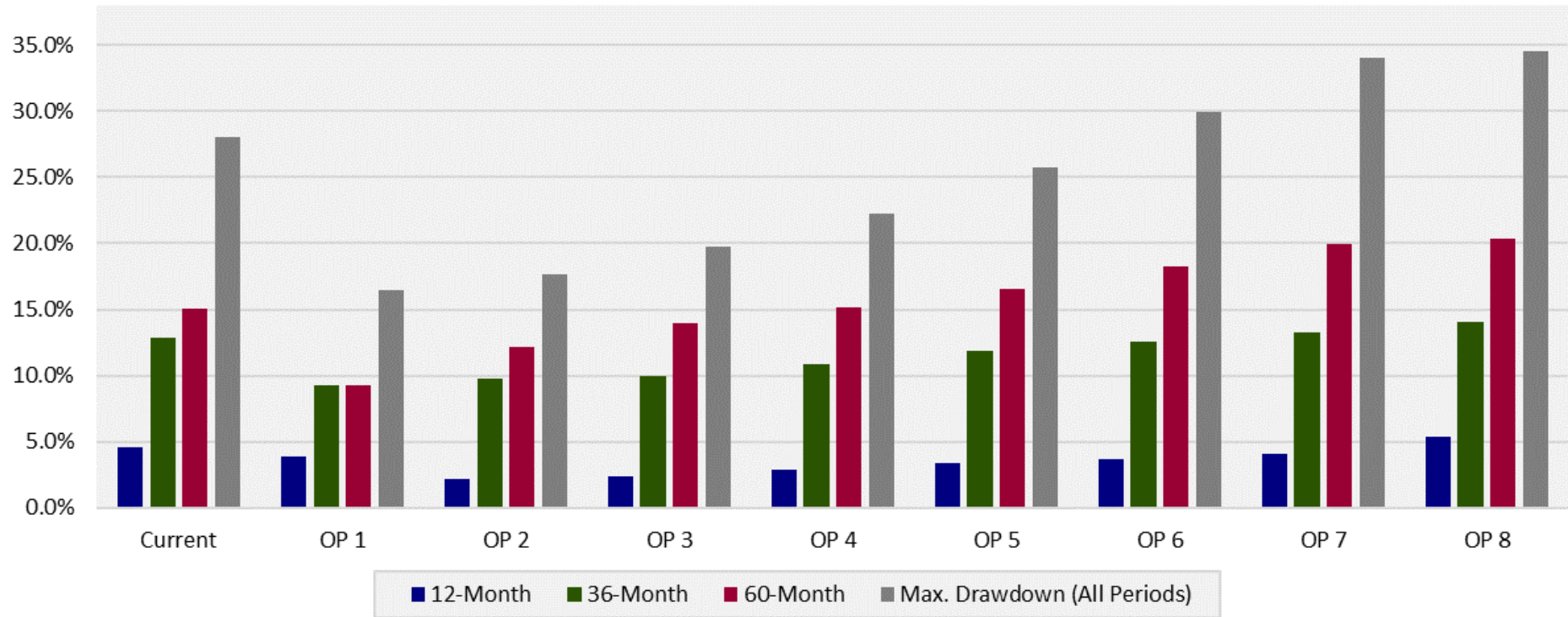
Worst Periods (12/2003 - 12/2023)

	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
1-Month	-9.95%	-6.58%	-8.80%	-10.08%	-10.82%	-11.57%	-12.56%	-13.59%	-13.75%
3-Month	-15.25%	-9.89%	-12.11%	-13.96%	-15.14%	-16.51%	-18.21%	-20.34%	-20.61%
12-Month	-23.38%	-15.32%	-16.12%	-17.94%	-19.97%	-22.67%	-25.72%	-28.74%	-28.78%



# Historical Performance - Maximum Drawdown

Maximum drawdown is the maximum peak to trough loss experienced during the past 12 months, 36 months, 60 months, or since the beginning of historical period.

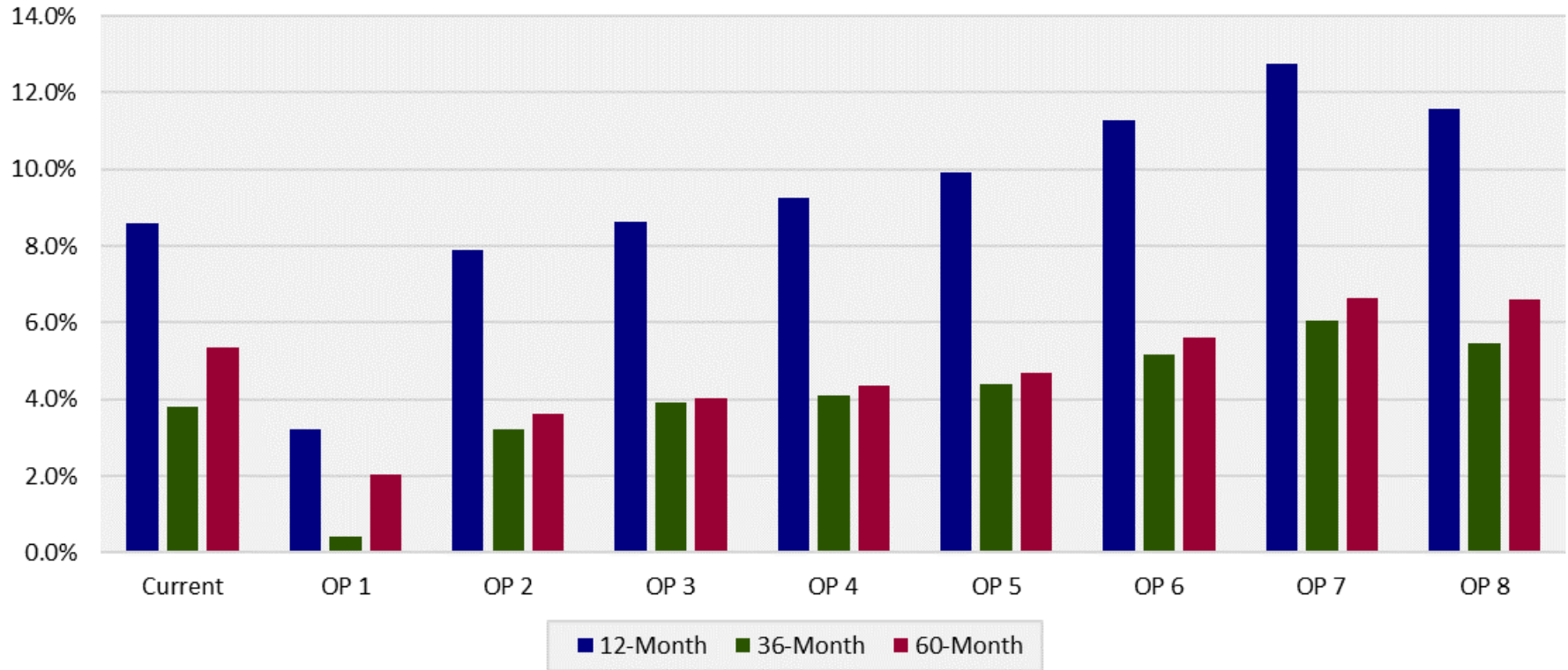


Maximum Drawdowns (12/2003 - 12/2023)

	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
12-Month	4.53%	3.86%	2.19%	2.39%	2.87%	3.36%	3.71%	4.04%	5.36%
36-Month	12.81%	9.29%	9.75%	9.92%	10.85%	11.81%	12.56%	13.29%	14.04%
60-Month	15.02%	9.29%	12.11%	13.96%	15.14%	16.51%	18.21%	19.92%	20.33%
Max. Drawdown (All Periods)	28.02%	16.47%	17.69%	19.75%	22.27%	25.76%	29.95%	34.06%	34.54%



# Historical Performance - Trailing Returns



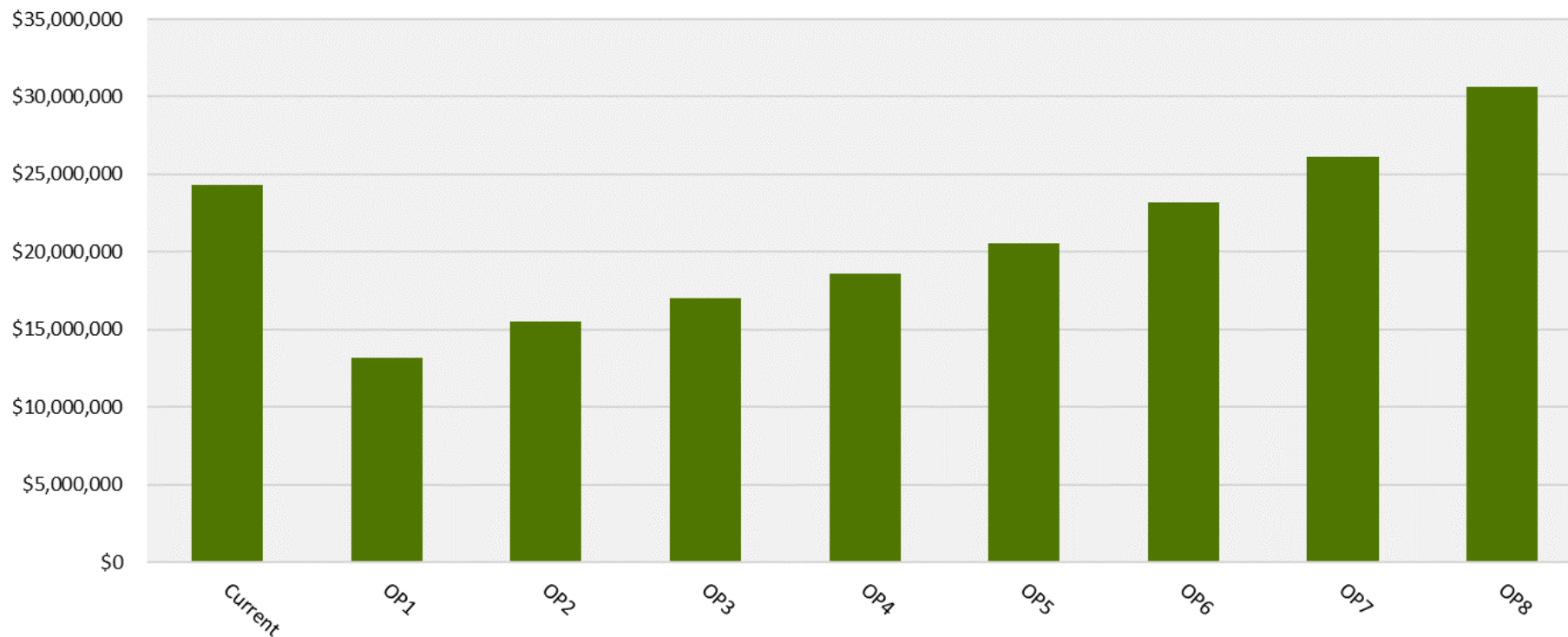
Trailing Returns (Annualized, 12/2003 - 12/2023)

	Current	OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	OP 7	OP 8
12-Month	8.59%	3.22%	7.89%	8.64%	9.24%	9.93%	11.27%	12.76%	11.59%
36-Month	3.81%	0.43%	3.20%	3.90%	4.11%	4.39%	5.17%	6.04%	5.48%
60-Month	5.37%	2.03%	3.63%	4.04%	4.34%	4.70%	5.61%	6.64%	6.61%



# Exposure to Loss - Value at Risk

Value at risk measured conventionally gives the worst outcome at a chosen probability at the end of an investment horizon. Continuous value at risk gives the worst outcome at a chosen probability from inception to any point throughout an investment horizon.



	Current	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8
Within-horizon	\$24,288,401	\$13,149,914	\$15,524,099	\$17,014,386	\$18,553,615	\$20,540,806	\$23,217,844	\$26,140,208	\$30,639,573

Portfolio Value = \$90,000,000



# Findings -

## *Portfolio Optimization & Stress Testing*

### **Model Inputs**

- Inputs are the existing target index plus ranges around each asset class (from the new IPS)
- The 2023 Horizon survey is used for all returns, correlations, and risk (standard deviation)
- The Horizon survey shows higher expected returns to non-US equity

### **Expected Returns**

- The current mix produces an expected return of 7.22% (Horizon Survey)
- It is possible to exceed the 7.0% goal return with lower risk (model 6)
- The highest-risk model produces an expected return of 8.0%

### **Stress Testing**

- The current asset mix has a VAR score of \$24M (26% drawdown)
- Lower-risk models 5 & 6 produce greater expected returns with lower VAR scores

### **Mean-Variance Portfolio Optimization**

- Models (1-6) deliver more return per unit of risk than the current mix
- Private credit receives allocations in most models (max in most scenarios)
- Private equity receives allocations in the highest return model



# Takeaways & Recommendations -

## *Investment Recommendations*

### Takeaways

- ✓ The current asset mix is now similar to other public pension systems
- ✓ The current allocation is appropriate to achieve the goal return
- ✓ Performance may be improved by increasing illiquid alternative strategies (Private Credit)
  - (25% in illiquid alts currently / model constraints 35%)
- x SEAS does not recommend an overweight to INTL & EM

### 2024 Recommendations

- ✓ Given cash flows, do not increase material above 25% in illiquid strategies
- ✓ With any new infusion of capital, consider private credit
  - Recommended managers have target returns of 10-17% (NET)
  - Many strategies have a current pay of 8-10% per year
- ✓ With some funds now in distribution, selectively consider follow-on private equity strategies



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