



**OREGON
STATE
TREASURY**

Oregon Investment Council

December 7, 2022

Cara Samples
Chair

Tobias Read
State Treasurer

Rex Kim
Chief Investment Officer



Investment Division
16290 SW Upper Boones Ferry Road
Tigard, OR 97224

Main Office
867 Hawthorne Ave SE
Salem, OR 97301

oregon.gov/treasury
oregon.treasurer@state.or.us



OREGON INVESTMENT COUNCIL

Agenda

December 7, 2022
9:00 AM

Oregon State Treasury
Investment Division
16290 SW Upper Boones Ferry Road
Tigard, OR 97224

<u>Time</u>	<u>A. Action Items</u>	<u>Presenter</u>	<u>Tab</u>
9:00-9:05	1. Review & Approval of Minutes November 2, 2022	Cara Samples <i>OIC Chair</i>	1
	2. Committee Reports	Rex Kim <i>Chief Investment Officer</i>	2
9:05-9:30	3. OPERF Asset/Liability Analysis	Karl Cheng <i>Senior Investment Officer, Portfolio Risk & Research</i> Allan Emkin <i>Managing Principal, Meketa</i> Raneen Jalajel <i>Associate Partner, Aon</i>	3
9:30-9:40	4. OPERF Opportunity Portfolio Consultant Approval	Mike Mueller <i>Investment Officer – Alternatives</i>	4

B. Information Items

9:40-10:30	5. OPERF Public Equity Annual Review	Louise Howard <i>Senior Investment Officer – Public Equity</i> Wil Hiles <i>Investment Officer – Public Equity</i> Claire Illo <i>Investment Officer – Public Equity</i> Raneen Jalajel <i>Associate Partner, Aon</i> Paola Nealon <i>Managing Partner, Meketa</i>	5
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Cara Samples
Chair

John Russell
Vice-Chair

Lorraine Arvin
Member

Pia Wilson-Body
Member

Tobias Read
State Treasurer

Kevin Olineck
PERS Director

----- BREAK -----

10:40-11:20	6. OPERF Q3 Performance Review	Mika Malone <i>Managing Partner, Meketa</i> Allan Emkin <i>Managing Partner, Meketa</i> Paola Nealon <i>Managing Partner, Meketa</i>	6
11:20	7. Asset Allocation & NAV Updates a. Oregon Public Employees Retirement Fund b. SAIF Corporation c. Common School Fund	Rex Kim	7
	8. Calendar — Future Agenda Items	Rex Kim	8
11:30	9. Open Discussion	OIC Member Staff Consultants	
11:45	10. Public Comments		

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TAB 1
REVIEW & APPROVAL OF MINUTES



**OREGON
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State of Oregon

Office of the State Treasurer

16290 SW Upper Boones Ferry Road
Tigard, Oregon 97224

OREGON INVESTMENT COUNCIL

November 2, 2022

Meeting Minutes

Members Present: Cara Sample, Lorraine Arvin, Tobias Read, Kevin Olineck, Pia Wilson-Body

Staff Present: Rex Kim, John Hershey, Michael Langdon, David Randall, Karl Cheng, Chris Ebersole, Michael Mueller, Aadrial Phillips, Alli Gordon

Staff Participating Virtually: Ahman Dirks, Aleshia Slaughter, Aliese Jacobsen, Amanda Kingsbury, Andrew Coutu, Andrew Robertson, Andrey Voloshinov, Angela Schaffers, Anna Totdahl, Austin Carmichael, Ben Mahon, Chris Ebersole, Claire Illo, Dana Millican, David Elott, Debra Day, Dmitri Palmateer, Eric Engelson, Eric Messer, Faith Sedberry, Ian Huculak, Jen Plett, Jeremy Knowles, John Lutkehaus, Josh Jones, Kenny Bao, Kristi Jenkins, Krystal Korthals, Louise Howard, Mark Selfridge, Missy Simpson, Mohammed Quraishi, Paul Koch, Perrin Lim, Roy Jackson, Ryan Auclair, Ryan Mann, Scott Robertson, Sommer May, Tan Cao, Tiffany Zahas, Tim, Miller, Tim Powers, Will Hampson, William Hiles, Philip Larrieu, Bradley Curran, Bryson Pate

Consultants Present: Colin Bebee, Paola Nealon (Meketa Investment Group, Inc.); Scott Preppernau, Ada Lin (Milliman); Raneen Jalajel (Aon); Chip Terhune, Gina Manley (SAIF); Debby Larsen (OSGP); Anne Heaphy, Uvan Tseng (Callan)

PERS Present: Matt Larrabee

Legal Counsel Present: Steve Malone (Department of Justice)

Before proceeding with the OIC meeting, Chief Investment Officer Rex Kim provided a disclosure pertaining to the hybrid set-up of this OIC meeting, informing those in attendance (virtual and in person) of the guidelines in which this meeting will proceed.

The November 2, 2022 OIC meeting was called to order at 9:01 am by Cara Samples, Chair.

I. 9:01 am Review and Approval of Minutes

MOTION: Chair Samples asked for approval of the September 7, 2022 OIC regular meeting minutes. Treasurer Reed moved approval at 9:01 am, and Member Arvin seconded the motion which then passed by a 4/0 vote.

II. 9:01 am Committee Reports

Private Equity Committee:



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September 14	CVC Asia VI	\$150M
October 11	Vitruvian Investment Partners V, L.P.	€225M

Real Estate Committee:

September 26	Oak Street Real Estate Capital Fund VI LP	\$200M
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Opportunity Committee:

September 26	Pathlight Capital Evergreen Fund	\$100M
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Alternatives Portfolio Committee:

September 26	Bridgewater Pure Alpha Major Markets II	\$250M
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Staff Discretion:

Common School Fund		
September 14	CVC Asia VI	\$15M
September 26	Bridgewater Pure Alpha Major Markets II	\$5M
October 12	Vitruvian Investment Partners V	€5M

III. 9:02 am OPERF Asset Allocation/Liability Analysis

Karl Cheng, Senior Investment Officer, Portfolio Risk & Research introduced the presenters.

Colin Bebee, Managing Principal, Meketa and Raneen Jalajel, Associate Partner, Aon provided a presentation about OPERF Asset and Liability Analysis, including a review of liquidity risk under the various proposed options. Staff and consultants provided to the Council for consideration three options, with each at a different level of risk. Each of the options removes Risk Parity, adding that amount to Private Equity. In addition, each of the three options provides a varying degree of allocation to public equity and fixed income, which provides for different levels of portfolio volatility.

Chair Samples requested that staff and consultants provide two additional options for the Council to consider. Specifically, she requested that the proportion (2.5%) reallocated to Private Equity from Risk Parity be put into either Public Equity or Fixed Income. Staff and consultants will provide these three options for the Council's consideration at the December meeting.

IV. 10:12 am Common School Fund Investment Policy Statement

John Hershey, Director of Investments and Raneen Jalajel, Associate Partner, Aon gave an update on the Common School Fund Investment Policy Statement project.

MOTION: Member Arvin moved approval of the Common School Fund Investment Policy Statement, the motion was seconded by Treasurer Reed and passed by a vote of 4/0.

V. 10:15 am State Accidental Insurance Fund Annual Review

Perrin Lim, Fixed Income Investment Officer, Chip Terhune, Chief Executive Officer, SAIF and Gina Manley, Vice President of Finance and Chief Financial Officer, SAIF presented the State Accidental Insurance Fund Annual Review. Performance for the year has been negative; however, this is expected given the significant rise in interest rates and the emphasis on fixed income for the SAIF portfolio.



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- VI. 11:10 am Oregon Savings Growth Plan Annual Review**
Debby Larsen, Program Manager, OSGP, Anne Heaphy, Senior Vice President, Plan Sponsor Consulting, Callan LLC, Uvan Tseng, Senior Vice President, Plan Sponsor Consulting, Callan LLC and Claire Illo, Investment Officer, Public Equity presented the OPERF Q3 performance report. Callan provided a review of the investment menu, recommending that the Council maintain the current structure and investment lineup.
- VII. 11:48 am Asset Allocation & NAV Updates**
Rex Kim, Chief Investment Officer presented the asset allocation and NAV updates.
- VIII. 11:50 am Calendar – Future Agenda Items**
Rex Kim presented the forward calendar. The Fixed Income Portfolio Review scheduled for January’s meeting will be moved to a later date.
- IX. 11:50 am Open Discussion**
Chair Samples opened the floor for discussion. No comments were made by consultants, staff or OIC members.
- X. 11:51 am Public Comments**
Chair Samples opened the floor to public comments. Public comments have also been submitted electronically and included with the public meeting book.

Ms. Samples adjourned the meeting at 12:15 pm.

Respectfully submitted,
Alli Gordon
Executive Support Specialist

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TAB 2
COMMITTEE REPORTS

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TAB 3

OPERF ASSET/LIABILITY ANALYSIS

OPERF Asset Allocation Update

Purpose

Staff recommends approval of one of three asset allocation options and associated policy revisions.

Background

OPERF is invested to meet long horizon obligations, mainly retirement benefit payments for eligible beneficiaries. To manage the Fund, the OIC periodically sets strategic asset allocation (SAA) targets for the asset class portfolios, sub-divisions of the investment universe organized by security types, underlying assets, implementation approaches, or combinations thereof. The Council considers expected returns & volatilities of the asset class portfolios and reviews proposed SAA targets. The target allocations approved by the OIC are then codified into policy under *INV 1203: Statement of Investment Objectives and Policy Framework for OPERF*.

Setting OPERF's asset allocation is one of the Council's most important investment decisions since the target weights to the broad asset classes will largely determine OPERF's performance. The asset allocation process attempts both to balance risk & return as well as maximize return per unit of risk, subject to implementation constraints such as the Fund's liquidity needs and available staff resources & investment opportunities.

The Council last revised OPERF's SAA targets at the June 2021 meeting when it approved:

- increased the Private Equity Portfolio target allocation from 17.5% to 20.0%,
- decreased the Public Equity Portfolio target allocation from 32.5% to 30.0%, and
- bifurcated the Alternatives Portfolio into the Real Assets and the Diversifying Strategies Portfolios.

Throughout the 2022 calendar year, the Council's investment consultants, Meketa Investment Group ("Meketa") and Aon Investments ("Aon"), and staff presented various topics relating to asset allocation, including:

- OPERF Risk Survey by Meketa at the April meeting;
- OPERF Liquidity by Aon and staff at the same meeting;
- Capital Market Assumptions (CMAs) by the investment consultants and staff at the June meeting;
- OPERF Preliminary Asset/Liability Analysis by Meketa, Milliman, the external actuary of the Public Employees Retirement System Board ("PERS Board"), and staff at the September meeting; and
- OPERF Asset/Liability Analysis, Liquidity, and Proposed Options by the investment consultants and staff at the November meeting.

Proposed Changes to OPERF's SAA

At the November board meeting, investment consultants and staff presented three options for OPERF asset allocation, including a recommendation for what was then labeled "Option 2". At the conclusion of that presentation, the Council requested analyses by the investment consultants of two additional asset allocations, labeled "Option 2A" with more Public Equity and "Option 2B" with more Fixed Income. The three asset allocations are tabulated below.

Option 2	Current Target Allocation (%)	Current Rebalancing Range (%)	Recommended Target Allocation (%)	Recommended Rebalancing Range (%)
Public Equity	30.0	25.0 – 35.0	25.0	20.0 – 30.0
Private Equity	20.0	17.5 – 27.5	22.5	17.5 – 27.5
Fixed Income	20.0	15.0 – 25.0	25.0	20.0 – 30.0
Real Estate	12.5	9.5 – 15.5	12.5	9.0 – 16.5
Real Assets	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Diversifying Strategies	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Risk Parity	2.5	0.0 – 2.5	0.0	0.0
Total Fund	100.0		100.0	

Option 2A	Current Target Allocation (%)	Current Rebalancing Range (%)	Recommended Target Allocation (%)	Recommended Rebalancing Range (%)
Public Equity	30.0	25.0 – 35.0	27.5	22.5 – 32.5
Private Equity	20.0	17.5 – 27.5	20.0	17.5 – 27.5
Fixed Income	20.0	15.0 – 25.0	25.0	20.0 – 30.0
Real Estate	12.5	9.5 – 15.5	12.5	9.0 – 16.5
Real Assets	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Diversifying Strategies	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Risk Parity	2.5	0.0 – 2.5	0.0	0.0
Total Fund	100.0		100.0	

Option 2B	Current Target Allocation (%)	Current Rebalancing Range (%)	Recommended Target Allocation (%)	Recommended Rebalancing Range (%)
Public Equity	30.0	25.0 – 35.0	25.0	20.0 – 30.0
Private Equity	20.0	17.5 – 27.5	20.0	17.5 – 27.5
Fixed Income	20.0	15.0 – 25.0	27.5	22.5 – 32.5
Real Estate	12.5	9.5 – 15.5	12.5	9.0 – 16.5
Real Assets	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Diversifying Strategies	7.5	2.5 – 10.0	7.5	2.5 – 10.0
Risk Parity	2.5	0.0 – 2.5	0.0	0.0
Total Fund	100.0		100.0	

Staff Recommendation

Approve one of the three asset allocations. These recommendations are reflected in the proposed changes to policies, subject to legal review:

- Revision to *INV 1203: Statement of Investment Objectives and Policy Framework for OPERF*, currently populated with “Option 2” asset allocation; and
- Retirement of *INV 610: Strategic Role of Risk Parity for OPERF*.

Oregon Investment Council

December 7, 2022

2022
Asset-Liability Study -
Continued Discussion



2022 Asset-Liability Study

- The following two slides provide concluding information for the 2022 Asset-Liability Study.

- Slide #3 contains asset-only information for five portfolios (including the *Actual* and *Current Policy* allocations) as well as corresponding *Reference Portfolios* that consist of volatility-matched Equity and Bond mixes.
 - While most of the discussion has focused on max drawdown as the risk metric for OPERF due to its negative cash flow posture, volatility is a more commonly used metric for developing reference portfolios and is potentially more applicable for basic Equity/Bond mixes.

- At the November 2022 OIC meeting, Staff, Aon, and Meketa recommended that the OIC select Option #2. After further discussion with the OIC, it was requested that slight variations of that portfolio be presented in December.
 - Alternative #2A is similar to Option #2, but 2.5% is shifted from Private Equity to Public Equity.
 - Alternative #2B is similar to Option #2, but 2.5% is shifted from Private Equity to Fixed Income.

- Slide #4 contains an efficient frontier graphic for the five detailed portfolios.



2022 Asset-Liability Study Conclusion - OIC

Asset-only Output

Allocations Under Consideration

	Current Policy	Actual Allocation	Option #2 (prior recommendation)	Alternative #2A	Alternative #2B
Public Equity	30.0%	23.0%	25.0%	27.5%	25.0%
Fixed Income	20.0%	20.0%	25.0%	25.0%	27.5%
Risk Parity	2.5%	2.0%	---	---	---
Private Equity	20.0%	28.0%	22.5%	20.0%	20.0%
Real Estate	12.5%	14.0%	12.5%	12.5%	12.5%
Real Assets	7.5%	8.0%	7.5%	7.5%	7.5%
Diversifying Strategies	7.5%	5.0%	7.5%	7.5%	7.5%
Expected Max Drawdown	41.4%	44.7%	40.0%	39.4%	37.8%
Expected Volatility	11.9%	12.7%	11.6%	11.4%	11.0%
Expected Return	7.7%	8.0%	7.6%	7.6%	7.5%
Illiquids	40.0%	50.0%	42.5%	40.0%	40.0%



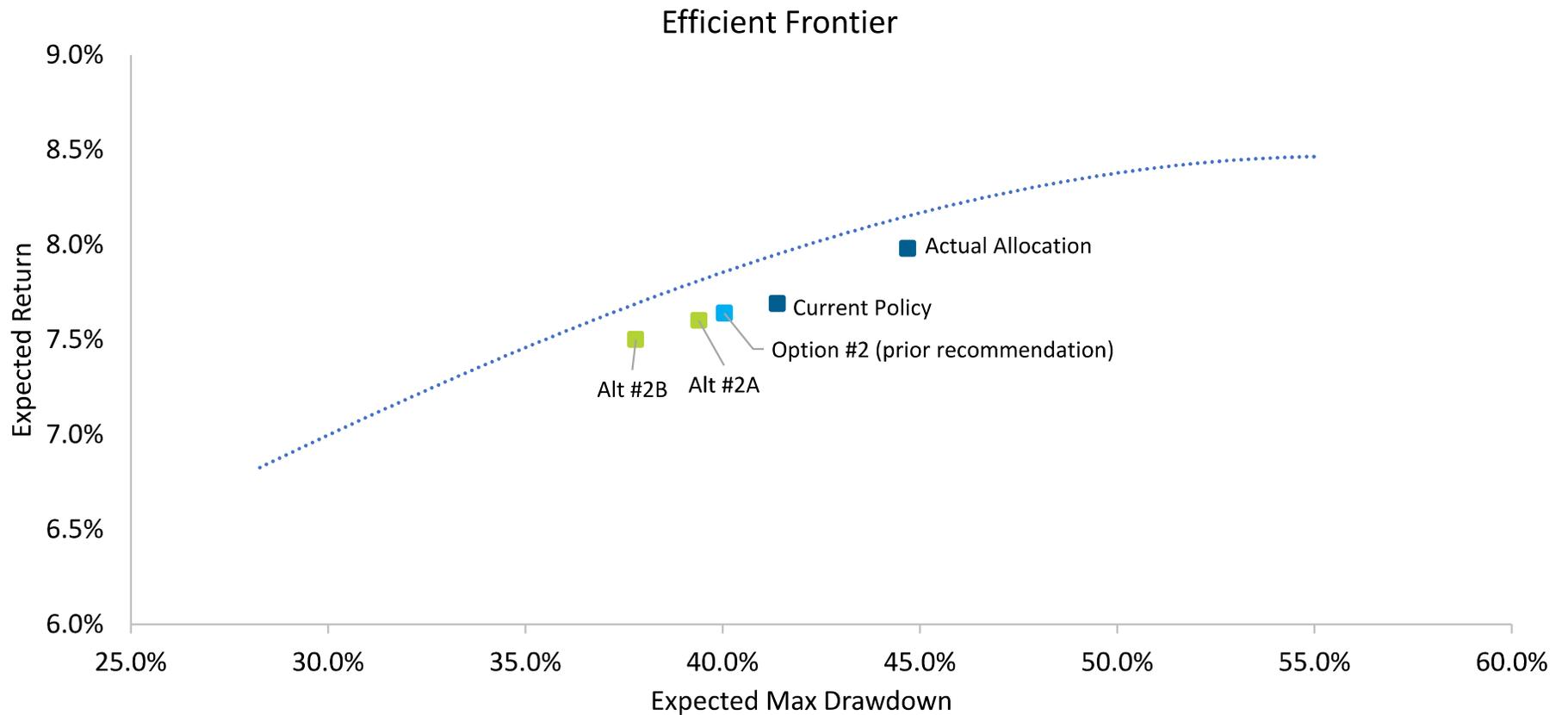
Volatility Matched Equity/Bond Reference Portfolios*

	65/35	70/30	65/35	62.5/37.5	60/40
Public Equity	65.0%	70.0%	65.0%	62.5%	60.0%
Fixed Income	35.0%	30.0%	35.0%	37.5%	40.0%
Risk Parity	---	---	---	---	---
Private Equity	---	---	---	---	---
Real Estate	---	---	---	---	---
Real Assets	---	---	---	---	---
Diversifying Strategies	---	---	---	---	---
Expected Max Drawdown	44.9%	48.4%	44.9%	43.1%	41.3%
Expected Volatility	11.8%	12.6%	11.8%	11.4%	11.0%
Expected Return	6.6%	6.7%	6.6%	6.5%	6.4%

*Volatility match is approximate (+/- 20 basis points) in order to use more rounded allocation percentages.



Efficient Frontier and Proposed Portfolios



→ The three remaining options/portfolios all reside in the “near-optimal” space from an asset-only perspective.

AON

Liquidity Analysis

Oregon Investment Council

November 2022

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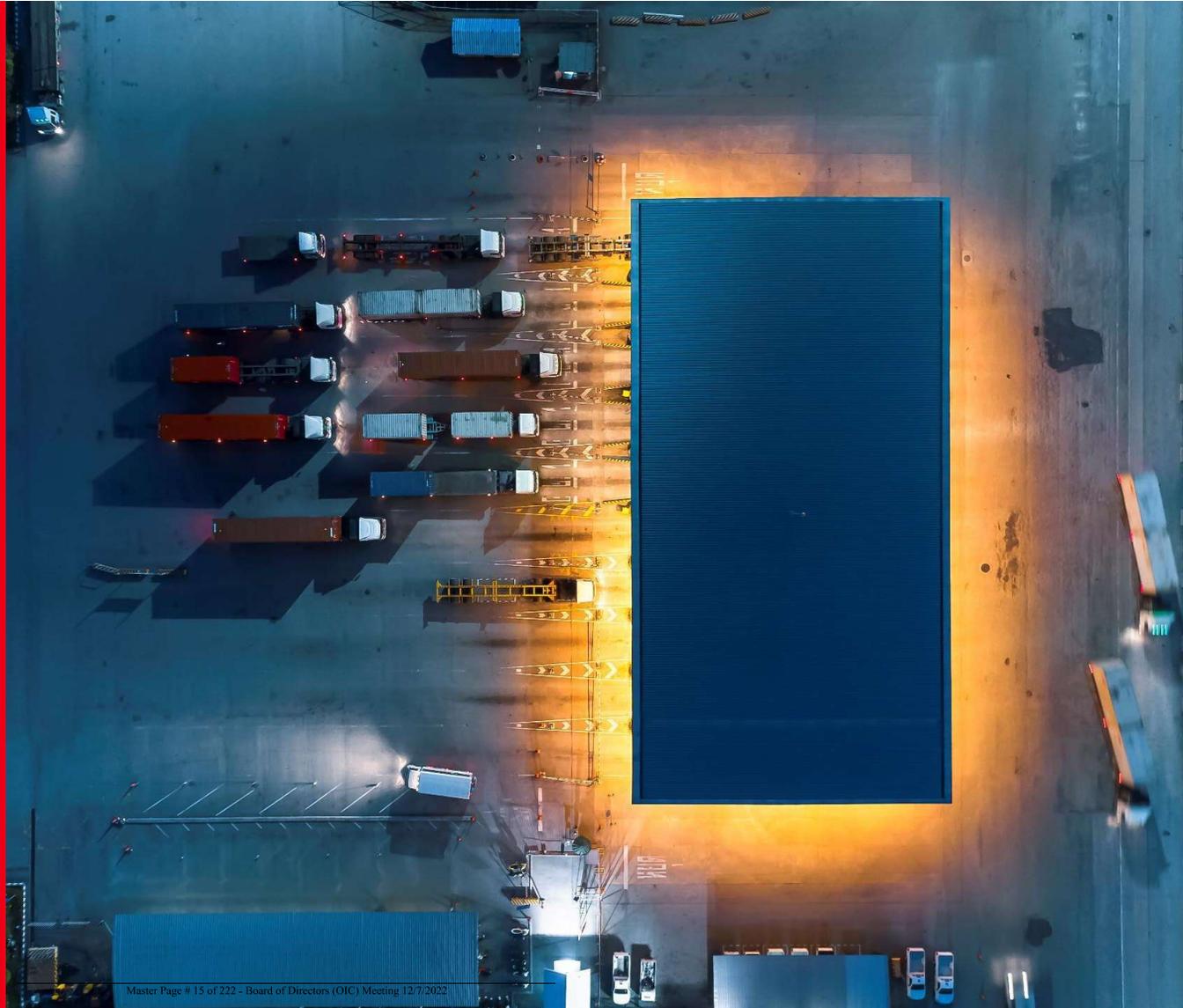


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Overview

Background

The liquidity analysis for Oregon Public Employees Retirement Fund (OPERF) is performed under five portfolio scenarios. These include OPERF's Current Policy, OPERF's Actual Allocation¹, and three alternative portfolios.

Intended as a stress-testing model, incorporating the profile of the liabilities as well as expected future contributions

Uses different scenarios for economic environments and other relevant events

Shows how the portfolio's liquidity profile could evolve with a given investment strategy

We categorized investments by liquidity into five buckets

Liquid (Risk-Reducing Assets): less than 3 months needed for return of capital (e.g. publicly traded securities)

Liquid (Return-Seeking Assets): less than 3 months needed for return of capital (e.g. publicly traded securities)

Quasi-Liquid: Typical lock-up of 3–12 months. Conservatively, we assumed a 1-year lock-up in most economic environments, 2 years in a Recession scenario, and 3 years in a Dark Skies scenario (e.g. many hedge funds, open-end real assets)

Illiquid: Potential lock-up of 5–10 years, depending on economic environment (e.g. closed-end real assets)

Illiquid: Potential lock-up of 10+ years (e.g. typical private equity)

This is intended to be a conservative approximation of the actual liquidity properties of the assets

¹Actual Allocation is as of August 2022

Overview

Asset allocation and liquidity category

	Current Policy	Actual	Option 2	Option 2A	Option 2B
Liquid (Risk-Reducing Assets)					
Core Fixed Income	20.0%	20.0%	25.0%	25.0%	27.5%
<i>Subtotal</i>	20.0%	20.0%	25.0%	25.0%	27.5%
Liquid (Return-Seeking Assets)					
Public Equity	30.0%	23.0%	25.0%	27.5%	25.0%
Risk Parity	2.5%	2.0%	--	--	--
<i>Subtotal</i>	32.5%	25.0%	25.0%	27.5%	25.0%
Quasi-Liquid Assets					
Alternatives (Diversifying Strategies)	7.5%	5.0%	7.5%	7.5%	7.5%
Real Estate	10.0%	11.2%	10.0%	10.0%	10.0%
<i>Subtotal</i>	17.5%	16.2%	17.5%	17.5%	17.5%
Illiquid 5-10 Years					
Real Estate	2.5%	2.8%	2.5%	2.5%	2.5%
Alternatives (Infrastructure)	4.5%	4.8%	4.5%	4.5%	4.5%
Alternatives (Natural Resources)	3.0%	3.2%	3.0%	3.0%	3.0%
<i>Subtotal</i>	10.0%	10.8%	10.0%	10.0%	10.0%
Illiquid 10+ Years					
Private Equity	20.0%	28.0%	22.5%	20.0%	20.0%
<i>Subtotal</i>	20.0%	28.0%	22.5%	20.0%	20.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Total Quasi + Illiquid Assets	47.5%	55.0%	50.0%	47.5%	47.5%



Overview

Economic scenarios

Base Case Scenario

Markets perform consistent with Aon's Capital Market Assumptions

Recession Scenario

Somewhat pessimistic outlook for the markets

Return-seeking assets decline in the first two years with a modest rebound in later years

Dark Skies Scenario

Very pessimistic outlook for markets

Return-seeking assets decline significantly

The value of public equities declines approximately 50% over three years, without an immediate rebound

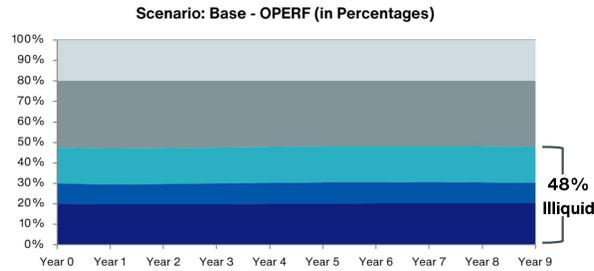


Liquidity Analysis

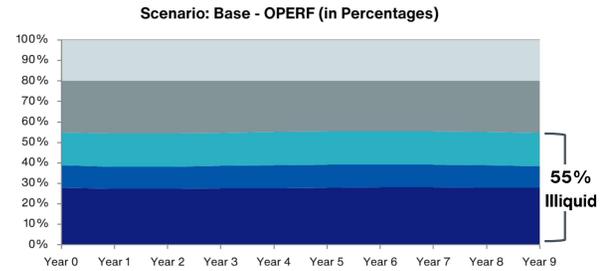
Base Case

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

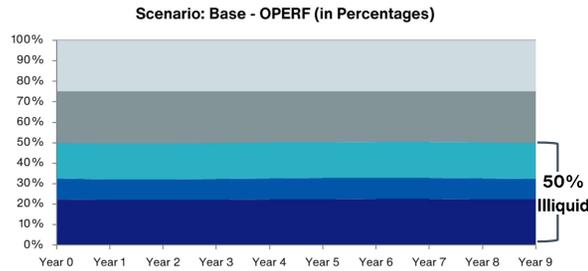
Current Policy



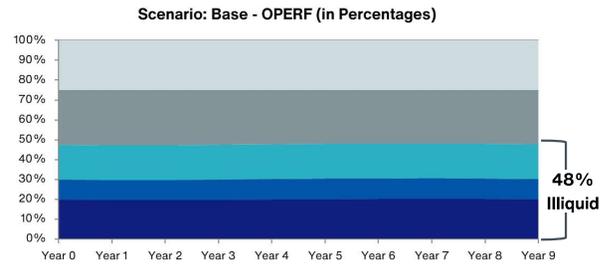
Actual



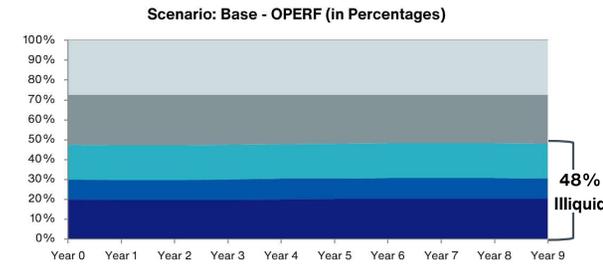
Option 2



Option 2A



Option 2B



Note: Year 0 represents a starting point of June 30, 2022

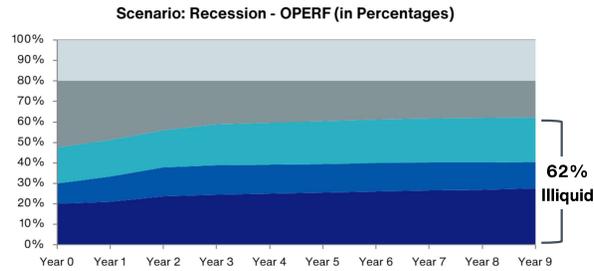
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Liquidity Analysis

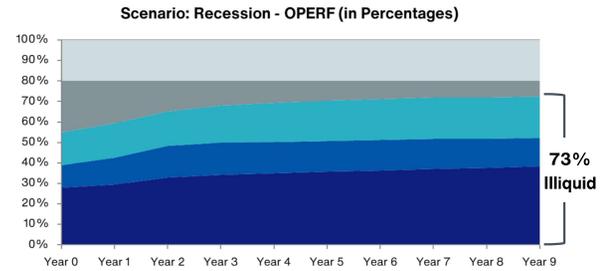
Recession

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

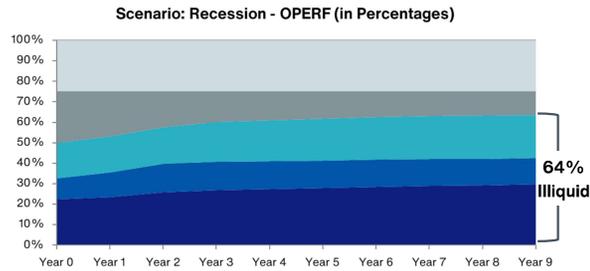
Current Policy



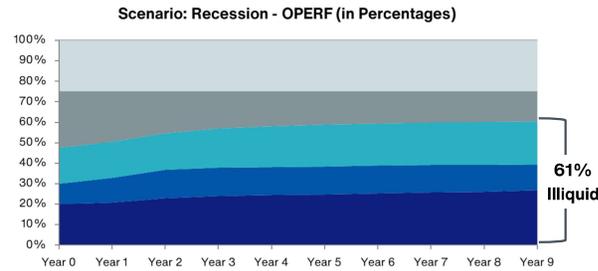
Actual



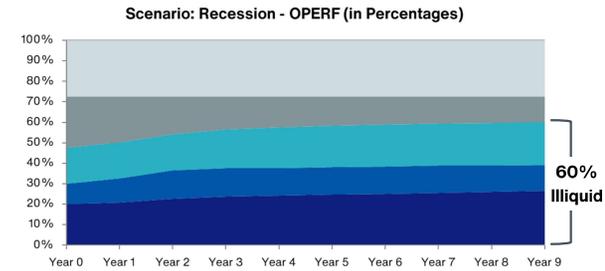
Option 2



Option 2A



Option 2B



Note: Year 0 represents a starting point of June 30, 2022

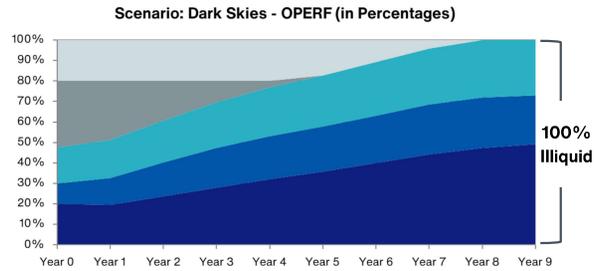
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Liquidity Analysis

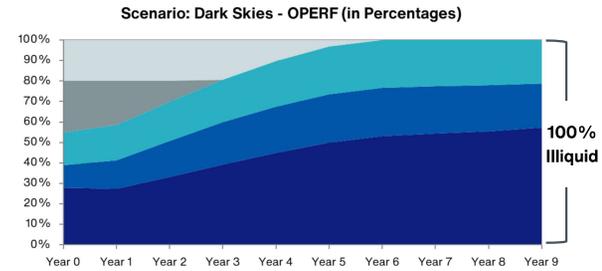
Dark Skies

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

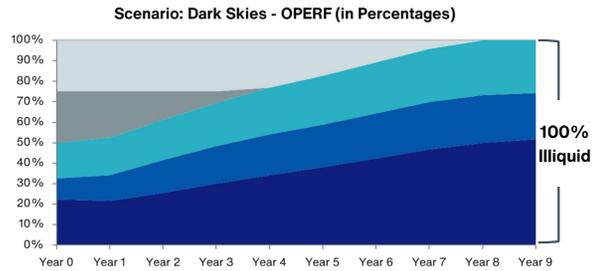
Current Policy



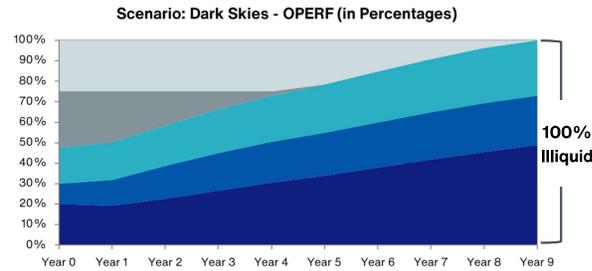
Actual



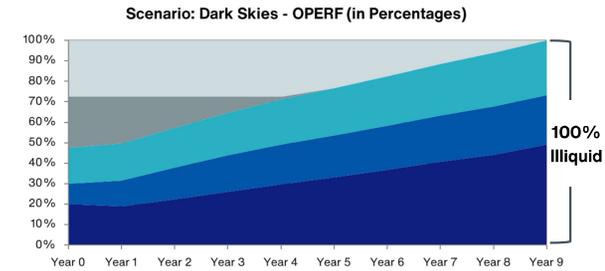
Option 2



Option 2A



Option 2B



Note: Year 0 represents a starting point of June 30, 2022

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Conclusions

Across all five portfolios, OPERF is expected to have sufficient liquidity in the modeled Base Case and Recession economic scenarios

In a Dark Skies economic scenario, the Plan’s assets are projected to be 100% illiquid in 6 to 9 years based on the liquidity profile of each portfolio which would compromise plan operations and force selling on the secondary market

Dark Skies Scenario	Current Policy	Actual	Option 2	Option 2A	Option 2B
Projected # of Years to be 100% Illiquid	8 yrs.	6 yrs.	8 yrs.	9 yrs.	9 yrs.

OPERF’s liquidity is strained due to the combined impact of asset returns, biennium rate setting, and employer contribution rate collars that slow the replenishing of Plan assets

As the risk reducing asset allocation increases in portfolio options 2, 2A, and 2B, the lower risk profile and additional liquidity delays the number of years projected to become 100% illiquid

Potential remedies for the Dark Skies scenario include 1) accepting this risk; 2) paring back commitments, selling on the secondary market, and/or redeeming quasi-liquid assets a few years into a deep bear market; 3) adjusting the target asset allocation; and 4) adjusting the funding policy

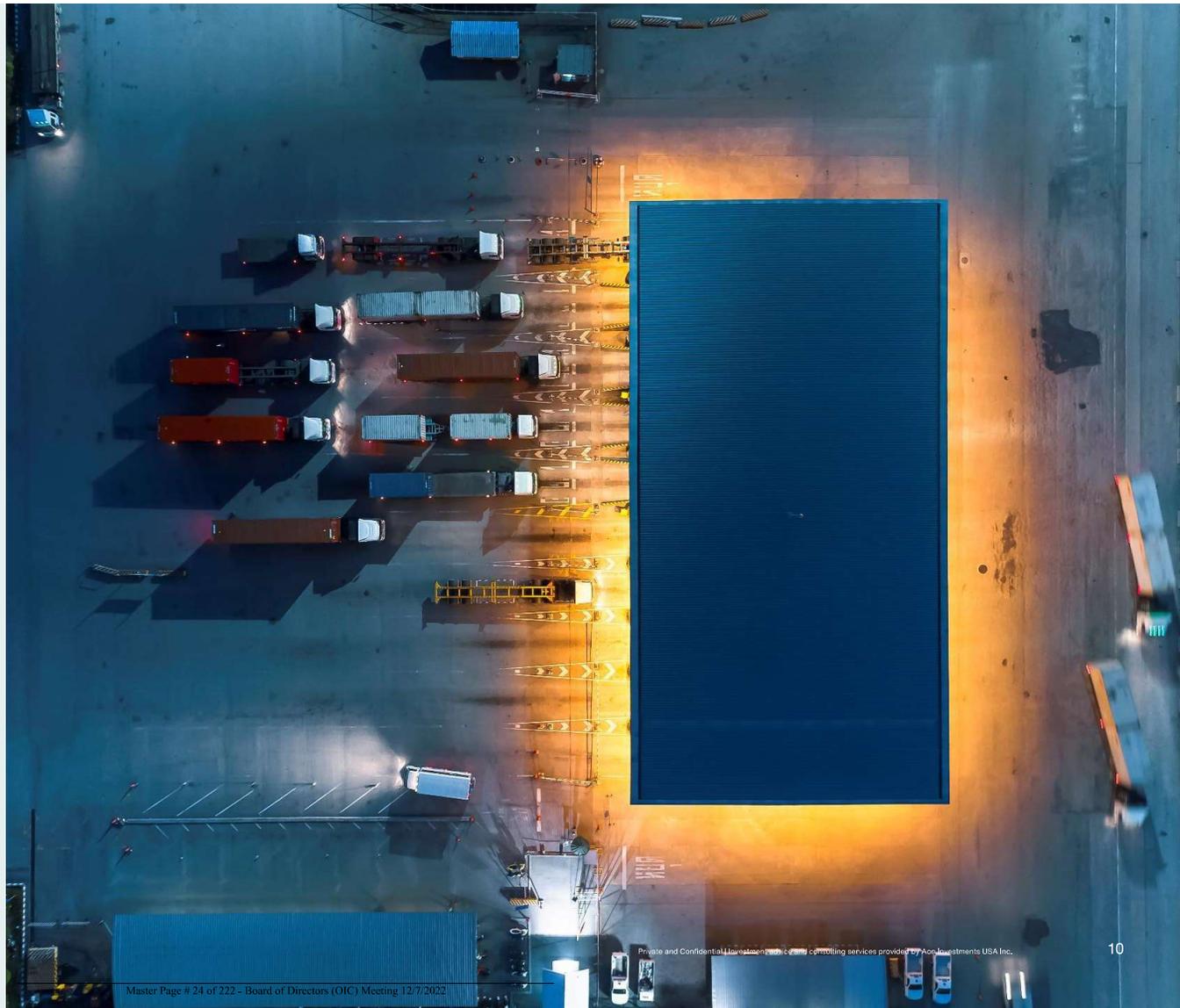
This analysis is highly sensitive to the assumed contributions

If OPERF receives less contributions than assumed, especially in a Dark Skies environment, then illiquid and quasi-liquid investments drift even further from target and the potential for liquidity issues increases



Appendix

- Liquidity Analysis Background
- Current Policy (80% R-S)
- Actual Allocation (80% R-S)
- Option 2 (75% R-S)
- Option 2A (75% R-S)
- Option 2B (72.5% R-S)
- Assumptions and Methods
- Economic Scenarios
- About This Material



Liquidity Analysis Background

Section: Appendix



Background

Aon Investments' approach to analyzing liquidity risk from alternatives

Intended as a stress-testing model

Develops multi-year projections of assets and spending needs

Uses different scenarios for economic environments and other relevant events

Shows how the portfolio's liquidity profile could evolve with a given investment strategy

Incorporates the profile of the liabilities as well as expected future contributions

Background

Process inputs and outputs



Current Policy (80% R-S)

Section: Appendix

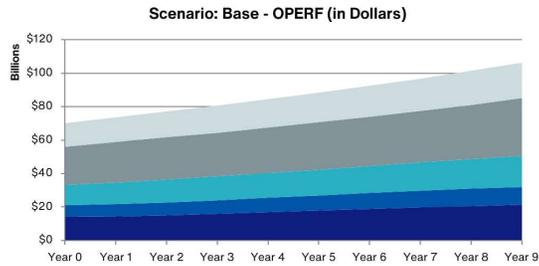


Liquidity Analysis

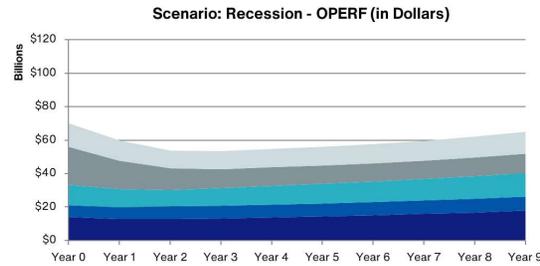
Current Policy (80% Return-Seeking)

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

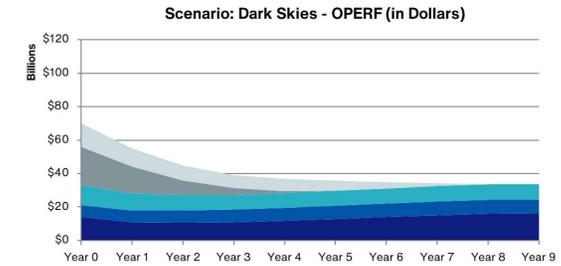
Base Case



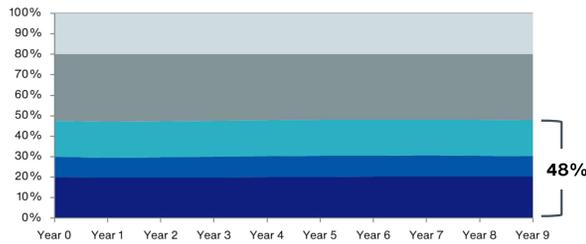
Recession



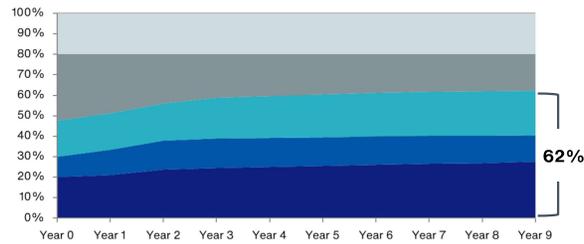
Dark Skies



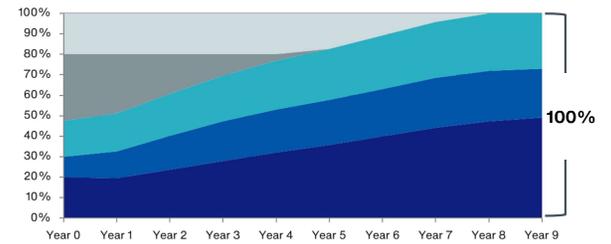
Scenario: Base - OPERF (in Percentages)



Scenario: Recession - OPERF (in Percentages)



Scenario: Dark Skies - OPERF (in Percentages)



Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Current Policy (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Current Policy allocation in the Base Case economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Liquid Return-Seeking	33	33	33	33	32	32	32	32	32	32
Total Liquid	53%	53%	53%	53%	52%	52%	52%	52%	52%	52%
Quasi-Liquid	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Illiquid: 5-10 Year Lock-up	10	10	10	10	10	10	10	10	10	10
Illiquid: 10+ Year Lock-up	20	20	20	20	20	20	20	20	20	20
Total Quasi + Illiquid	48%	47%	47%	47%	48%	48%	48%	48%	48%	48%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	72%	73%	75%	77%	79%	81%	84%	86%	89%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.1	\$3.3	\$3.8	\$4.3	\$4.5	\$4.6	\$4.7

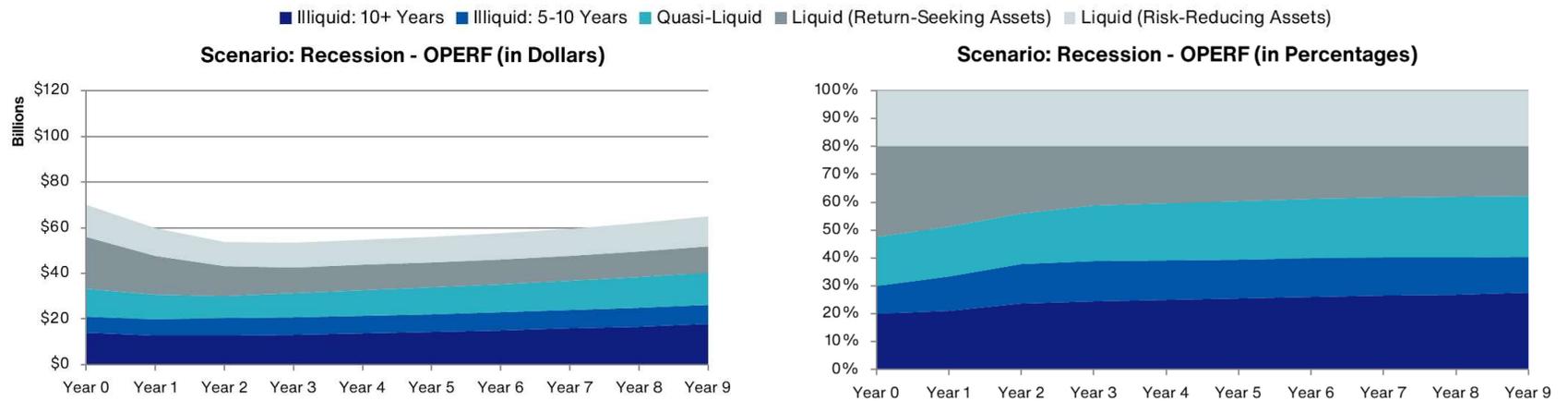
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Recession economic scenario – Current Policy (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Current Policy allocation in the Recession economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 62% of the Plan due to the shrinking market value of the total Plan in this scenario
- There would not be a concern with the ability to pay benefits
- The OIC may need to redeem some quasi-liquid assets to stay close to its target allocation (48% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Recession economic scenario – Current Policy (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Current Policy allocation in the Recession economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Liquid Return-Seeking	33	29	24	21	20	20	19	18	18	18
Total Liquid	53%	49%	44%	41%	40%	40%	39%	38%	38%	38%
Quasi-Liquid	18%	18%	18%	20%	21%	21%	21%	21%	22%	22%
Illiquid: 5-10 Year Lock-up	10	12	14	14	14	14	14	14	13	13
Illiquid: 10+ Year Lock-up	20	21	24	24	25	26	26	27	27	28
Total Quasi + Illiquid	48%	51%	56%	59%	60%	60%	61%	62%	62%	62%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	58%	52%	50%	51%	51%	52%	53%	54%	56%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$3.0	\$3.5	\$4.1	\$4.7	\$5.3	\$5.8	\$6.3	\$6.7

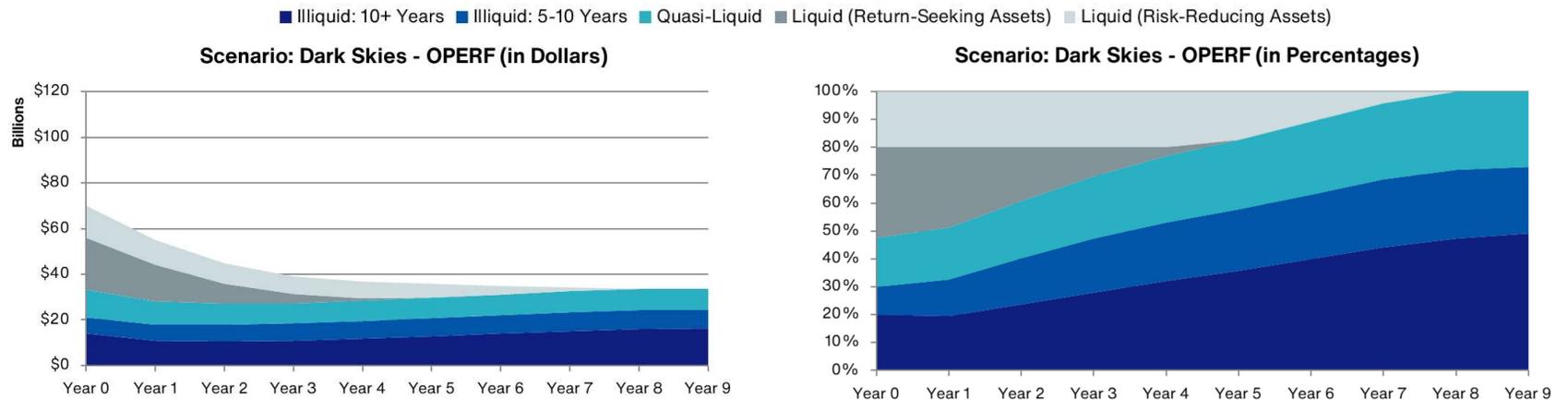
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Dark Skies economic scenario – Current Policy (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Current Policy allocation in the Dark Skies economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 100% of the Plan due to the shrinking market value of the total Plan in this scenario
- In this scenario, the OIC may want to pare back future commitments to stay closer to the target allocations; however, the allocation would still be significantly different from the target allocation (48% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Dark Skies economic scenario – Current Policy (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Current Policy allocation in the Dark Skies economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	20%	20%	17%	11%	4%	0%	0%
Liquid Return-Seeking	33	29	19	10	3	0	0	0	0	0
Total Liquid	53%	49%	39%	30%	23%	17%	11%	4%	0%	0%
Quasi-Liquid	18%	19%	21%	22%	24%	25%	26%	27%	28%	27%
Illiquid: 5-10 Year Lock-up	10	13	17	19	21	22	23	24	25	24
Illiquid: 10+ Year Lock-up	20	20	24	28	32	36	40	44	47	49
Total Quasi + Illiquid	48%	51%	61%	70%	77%	83%	89%	96%	100%	100%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	54%	43%	37%	35%	33%	32%	31%	30%	30%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.6	\$4.2	\$4.7	\$5.1	\$5.5	\$5.9	\$6.4

Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Actual Allocation (80% R-S)

Section: Appendix

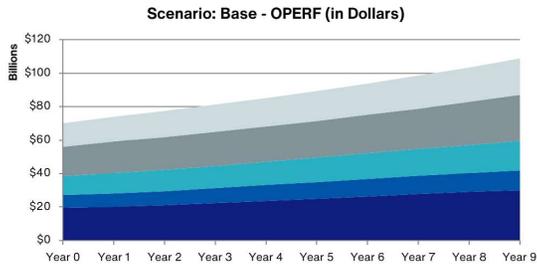


Liquidity Analysis

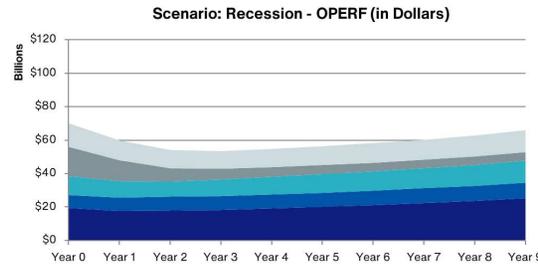
Actual Allocation (80% Return-Seeking)

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

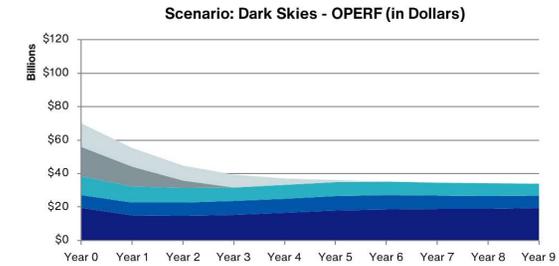
Base Case



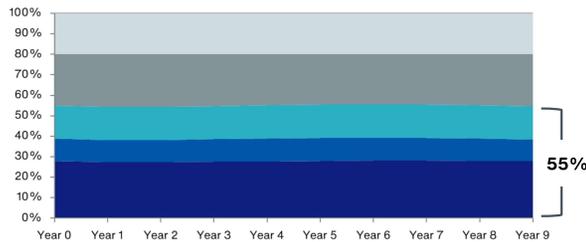
Recession



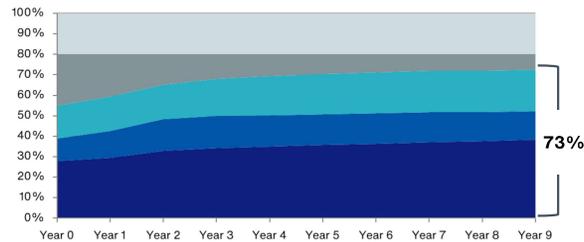
Dark Skies



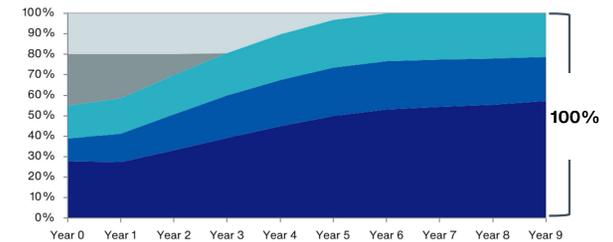
Scenario: Base - OPERF (in Percentages)



Scenario: Recession - OPERF (in Percentages)



Scenario: Dark Skies - OPERF (in Percentages)



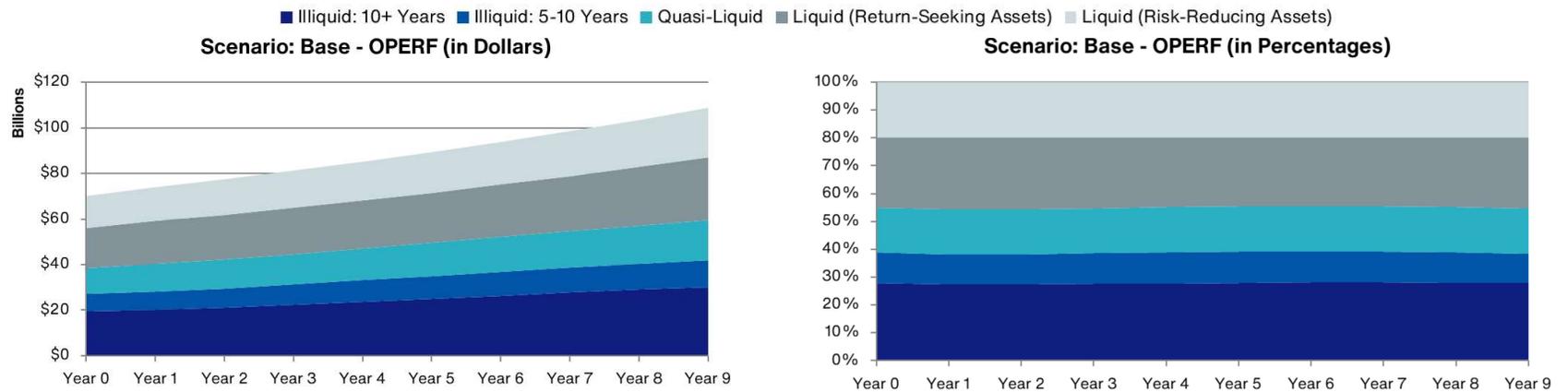
Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Base Case economic scenario, assuming commitments are continued as expected



Key Takeaway:

- Total illiquid and quasi-liquid assets are projected to stay near 55% of the Plan and can be maintained near the target with no cash flow problems

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Base Case economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Liquid Return-Seeking	25	26	26	25	25	25	25	25	25	25
Total Liquid	45%	46%	46%	45%						
Quasi-Liquid	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
Illiquid: 5-10 Year Lock-up	11	11	11	11	11	11	11	11	11	11
Illiquid: 10+ Year Lock-up	28	27	27	28	28	28	28	28	28	28
Total Quasi + Illiquid	55%	54%	54%	55%						

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	72%	74%	76%	78%	80%	83%	85%	88%	91%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.1	\$3.3	\$3.8	\$4.3	\$4.4	\$4.6	\$4.6

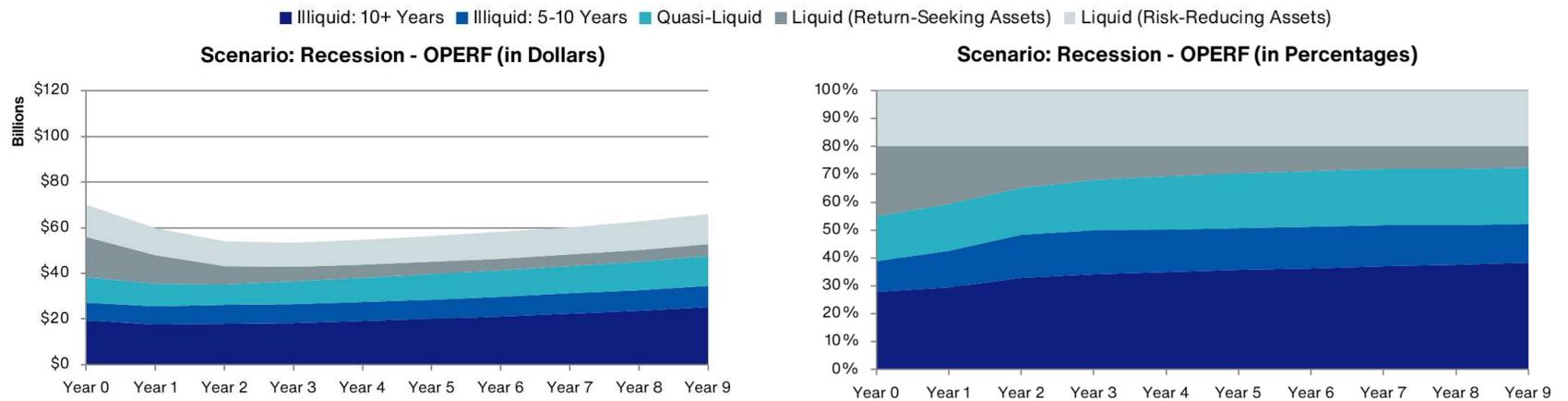
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Recession economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Recession economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 73% of the Plan due to the shrinking market value of the total Plan in this scenario
- There would not be a concern with the ability to pay benefits
- The OIC may need to redeem some quasi-liquid assets to stay close to its target allocation (55% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Recession economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Recession economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Liquid Return-Seeking	25	21	15	12	11	10	9	8	8	7
Total Liquid	45%	41%	35%	32%	31%	30%	29%	28%	28%	27%
Quasi-Liquid	16%	17%	17%	18%	19%	19%	20%	20%	20%	20%
Illiquid: 5-10 Year Lock-up	11	13	15	16	15	15	15	15	14	14
Illiquid: 10+ Year Lock-up	28	30	33	34	35	36	36	37	37	38
Total Quasi + Illiquid	55%	59%	65%	68%	69%	70%	71%	72%	72%	73%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	58%	52%	50%	51%	52%	52%	54%	55%	57%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$3.0	\$3.5	\$4.1	\$4.7	\$5.3	\$5.8	\$6.3	\$6.7

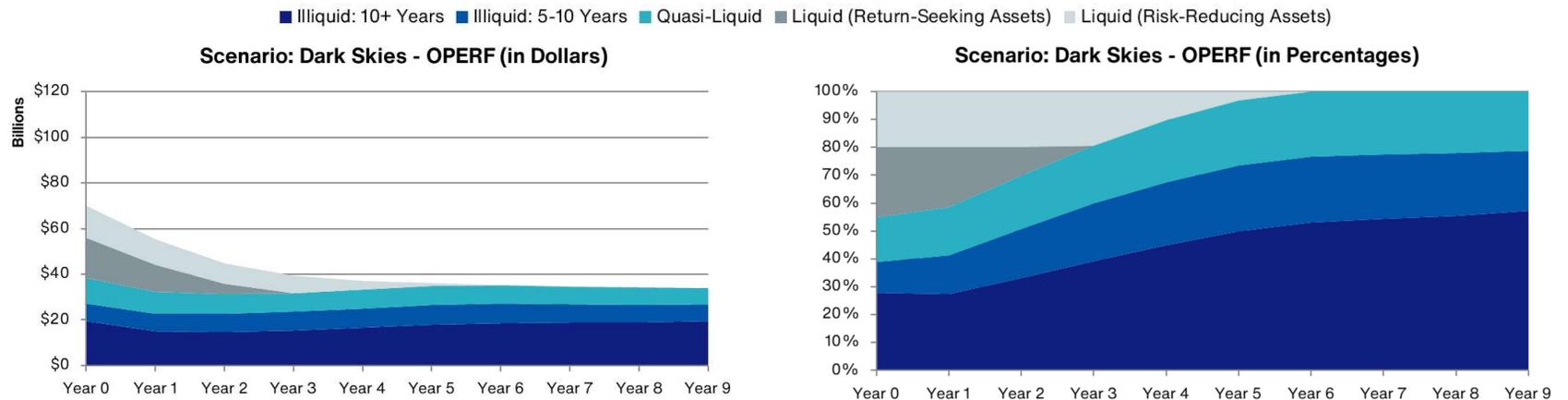
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Dark Skies economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Dark Skies economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 100% of the Plan due to the shrinking market value of the total Plan in this scenario
- In this scenario, the OIC may want to pare back future commitments to stay closer to the target allocations; however, the allocation would still be significantly different from the target allocation (55% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Dark Skies economic scenario – Actual Allocation (80% R-S)

The exhibit below shows the projected liquidity lock-up of the Actual allocation in the Dark Skies economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	20%	20%	20%	19%	10%	3%	0%	0%	0%	0%
Liquid Return-Seeking	25	21	10	0	0	0	0	0	0	0
Total Liquid	45%	41%	30%	19%	10%	3%	0%	0%	0%	0%
Quasi-Liquid	16%	17%	19%	21%	22%	23%	23%	23%	22%	21%
Illiquid: 5-10 Year Lock-up	11	14	18	21	23	24	24	23	23	22
Illiquid: 10+ Year Lock-up	28	27	33	39	45	50	53	54	55	57
Total Quasi + Illiquid	55%	59%	70%	81%	90%	97%	100%	100%	100%	100%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	54%	43%	37%	35%	34%	32%	31%	31%	30%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.6	\$4.2	\$4.7	\$5.1	\$5.5	\$5.9	\$6.4

Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Option 2 (75% R-S)

Section: Appendix

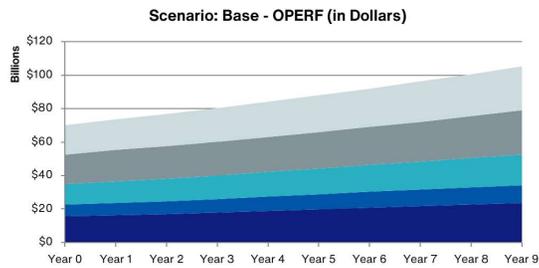


Liquidity Analysis

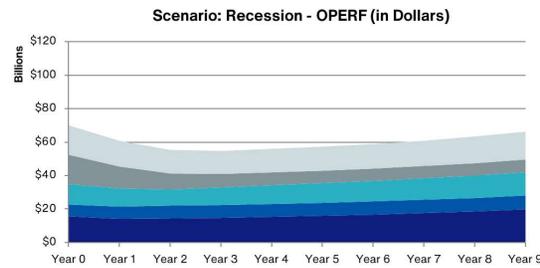
Option 2 (75% Return-Seeking)

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

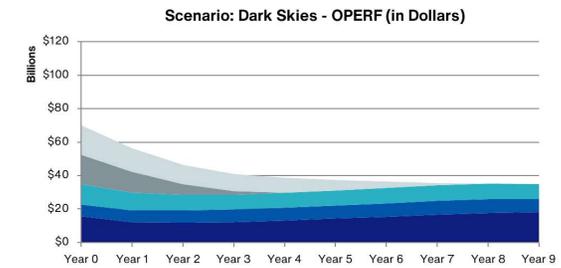
Base Case



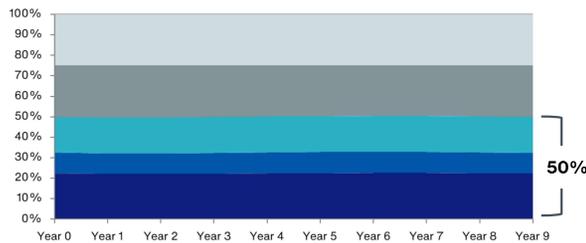
Recession



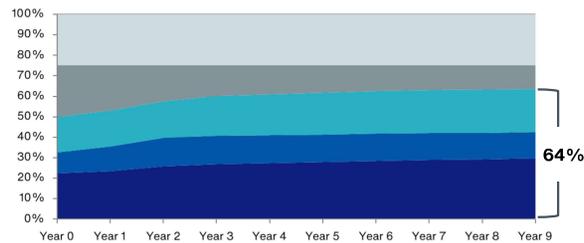
Dark Skies



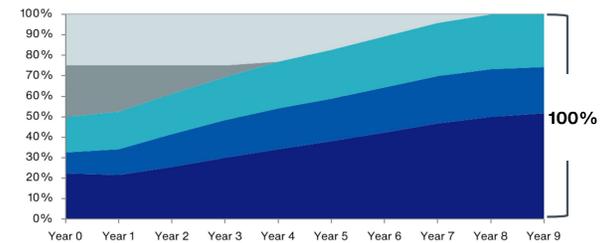
Scenario: Base - OPERF (in Percentages)



Scenario: Recession - OPERF (in Percentages)



Scenario: Dark Skies - OPERF (in Percentages)



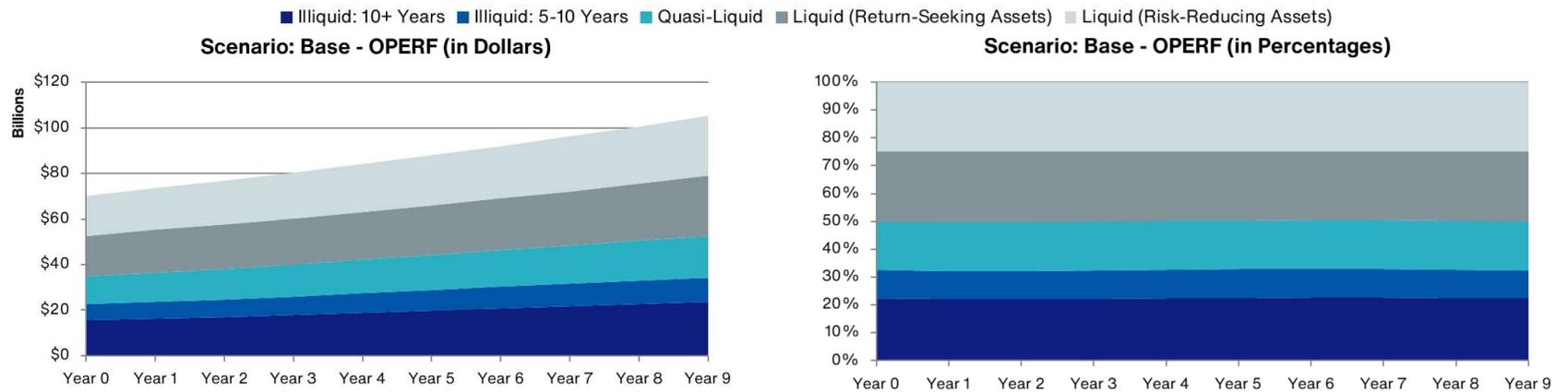
Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Base Case economic scenario, assuming commitments are continued as expected



Key Takeaway:

- Total illiquid and quasi-liquid assets are projected to stay near 50% of the Plan and can be maintained near the target with no cash flow problems

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Base Case economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Liquid Return-Seeking	25	25	25	25	25	25	25	25	25	25
Total Liquid	50%									
Quasi-Liquid	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Illiquid: 5-10 Year Lock-up	10	10	10	10	10	10	10	10	10	10
Illiquid: 10+ Year Lock-up	23	22	22	22	22	22	23	23	22	22
Total Quasi + Illiquid	50%									

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	72%	73%	75%	77%	79%	81%	83%	86%	88%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.1	\$3.3	\$3.8	\$4.3	\$4.5	\$4.6	\$4.7

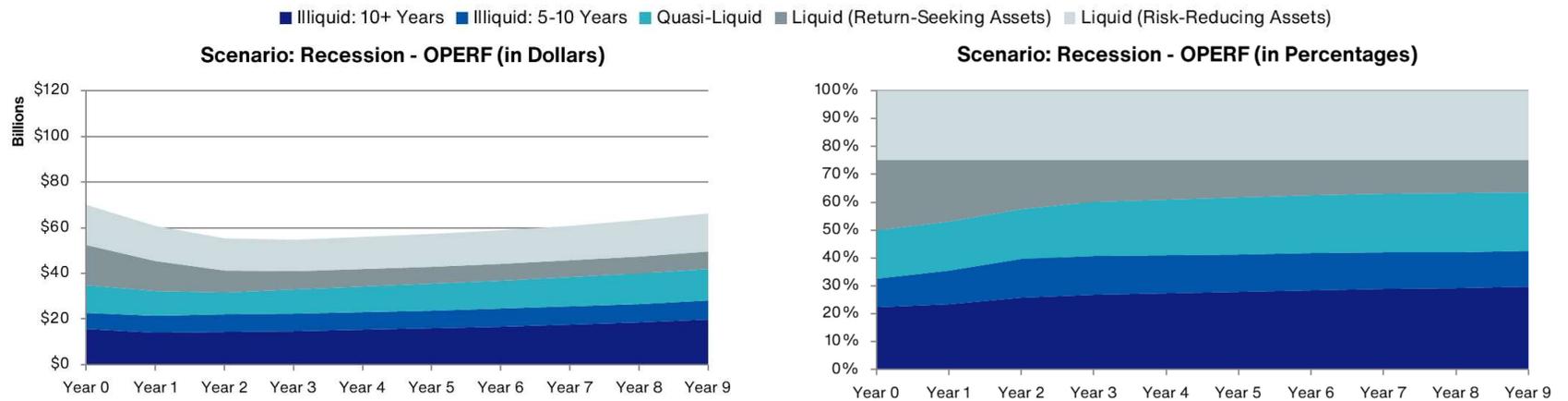
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Recession economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Recession economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 64% of the Plan due to the shrinking market value of the total Plan in this scenario
- There would not be a concern with the ability to pay benefits
- The OIC may need to redeem some quasi-liquid assets to stay close to its target allocation (50% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Recession economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Recession economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Liquid Return-Seeking	25	22	18	15	14	13	13	12	12	11
Total Liquid	50%	47%	43%	40%	39%	38%	38%	37%	37%	36%
Quasi-Liquid	18%	18%	18%	19%	20%	20%	21%	21%	21%	21%
Illiquid: 5-10 Year Lock-up	10	12	14	14	14	14	13	13	13	13
Illiquid: 10+ Year Lock-up	23	23	26	27	27	28	28	29	29	30
Total Quasi + Illiquid	50%	53%	57%	60%	61%	62%	62%	63%	63%	64%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	59%	53%	52%	52%	52%	53%	54%	56%	57%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$3.0	\$3.5	\$4.1	\$4.7	\$5.2	\$5.8	\$6.3	\$6.7

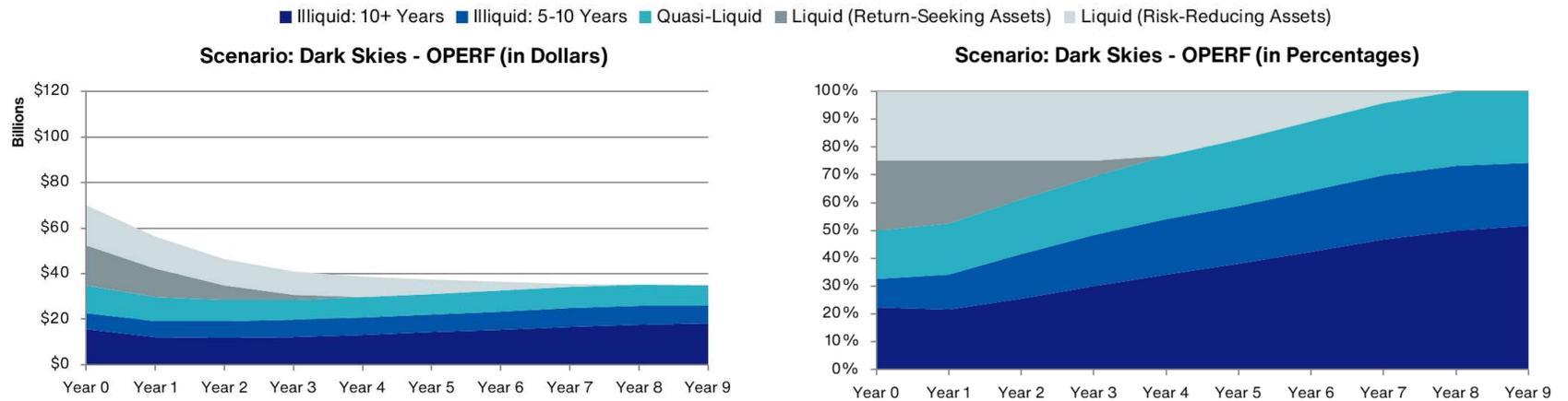
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Dark Skies economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Dark Skies economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 100% of the Plan due to the shrinking market value of the total Plan in this scenario
- In this scenario, the OIC may want to pare back future commitments to stay closer to the target allocations; however, the allocation would still be significantly different from the target allocation (50% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Dark Skies economic scenario – Option 2 (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2 allocation in the Dark Skies economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	23%	17%	11%	4%	0%	0%
Liquid Return-Seeking	25	22	14	6	0	0	0	0	0	0
Total Liquid	50%	47%	39%	31%	23%	17%	11%	4%	0%	0%
Quasi-Liquid	18%	18%	20%	21%	23%	24%	25%	26%	27%	26%
Illiquid: 5-10 Year Lock-up	10	13	16	18	20	21	22	23	24	23
Illiquid: 10+ Year Lock-up	23	22	26	30	34	38	42	47	50	52
Total Quasi + Illiquid	50%	53%	61%	69%	77%	83%	89%	96%	100%	100%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	55%	45%	39%	36%	35%	33%	32%	32%	31%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.4	\$4.0	\$4.6	\$5.1	\$5.5	\$5.9	\$6.4

Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Option 2A (75% R-S)

Section: Appendix

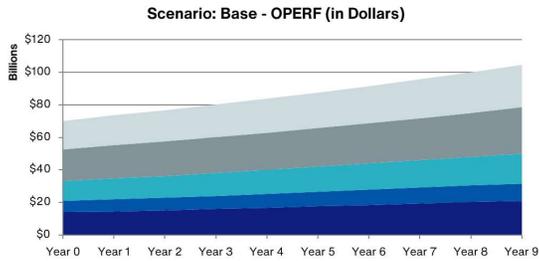


Liquidity Analysis

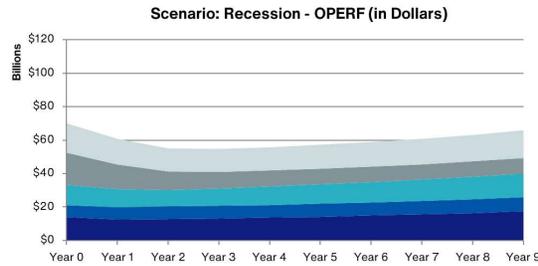
Option 2A (75% Return-Seeking)

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid (Return-Seeking Assets) ■ Liquid (Risk-Reducing Assets)

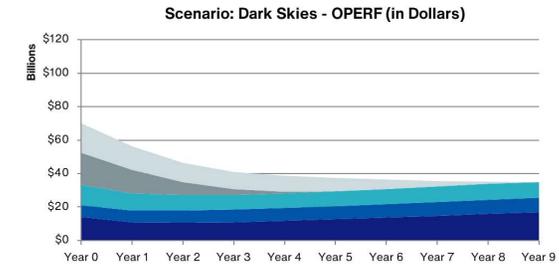
Base Case



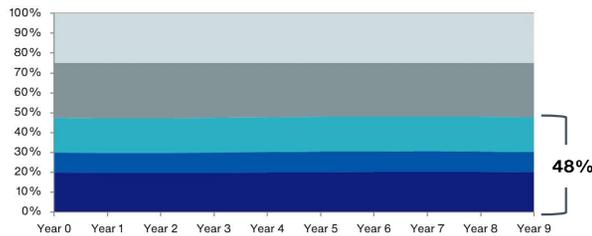
Recession



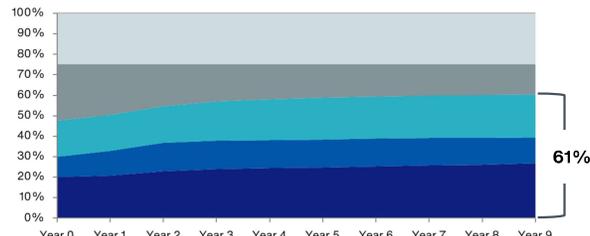
Dark Skies



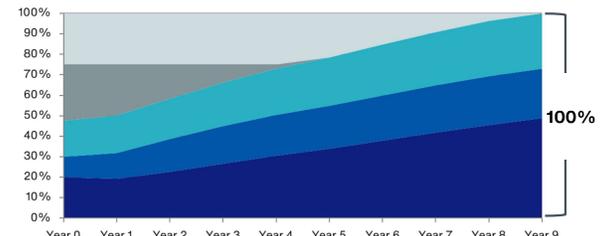
Scenario: Base - OPERF (in Percentages)



Scenario: Recession - OPERF (in Percentages)



Scenario: Dark Skies - OPERF (in Percentages)



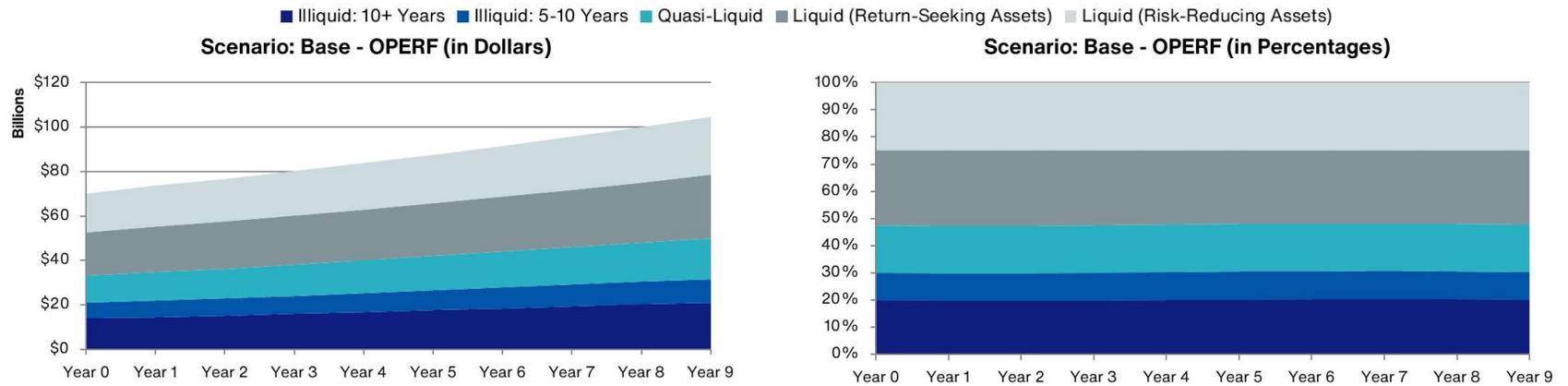
Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Base Case economic scenario, assuming commitments are continued as expected



Key Takeaway:

- Total illiquid and quasi-liquid assets are projected to stay near 47.5% of the Plan and can be maintained near the target with no cash flow problems

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Base Case economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Liquid Return-Seeking	28	28	28	28	27	27	27	27	27	27
Total Liquid	53%	53%	53%	53%	52%	52%	52%	52%	52%	52%
Quasi-Liquid	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Illiquid: 5-10 Year Lock-up	10	10	10	10	10	10	10	10	10	10
Illiquid: 10+ Year Lock-up	20	20	20	20	20	20	20	20	20	20
Total Quasi + Illiquid	48%	47%	47%	47%	48%	48%	48%	48%	48%	48%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	72%	73%	75%	77%	79%	81%	83%	85%	88%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.1	\$3.3	\$3.8	\$4.3	\$4.5	\$4.6	\$4.7

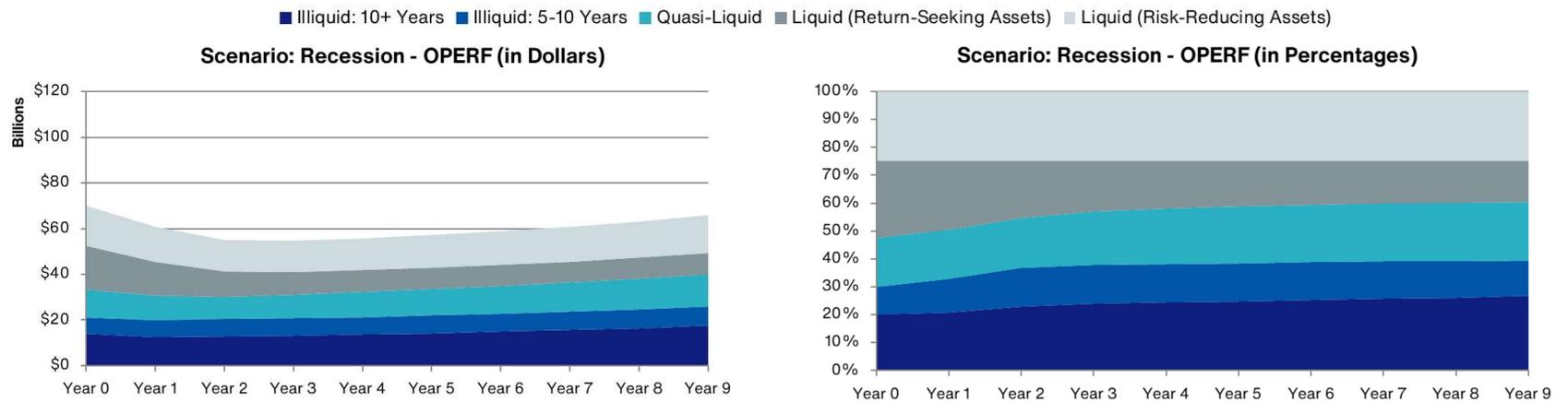
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Recession economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Recession economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 61% of the Plan due to the shrinking market value of the total Plan in this scenario
- There would not be a concern with the ability to pay benefits
- The OIC may need to redeem some quasi-liquid assets to stay close to its target allocation (47.5% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Recession economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Recession economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Liquid Return-Seeking	28	25	20	18	17	16	16	15	15	14
Total Liquid	53%	50%	45%	43%	42%	41%	41%	40%	40%	39%
Quasi-Liquid	18%	18%	18%	19%	20%	20%	21%	21%	21%	21%
Illiquid: 5-10 Year Lock-up	10	12	14	14	14	14	13	13	13	13
Illiquid: 10+ Year Lock-up	20	21	23	24	24	25	25	26	26	27
Total Quasi + Illiquid	48%	50%	55%	57%	58%	59%	59%	60%	60%	61%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	59%	53%	51%	52%	52%	53%	54%	55%	57%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$3.0	\$3.5	\$4.1	\$4.7	\$5.2	\$5.8	\$6.3	\$6.7

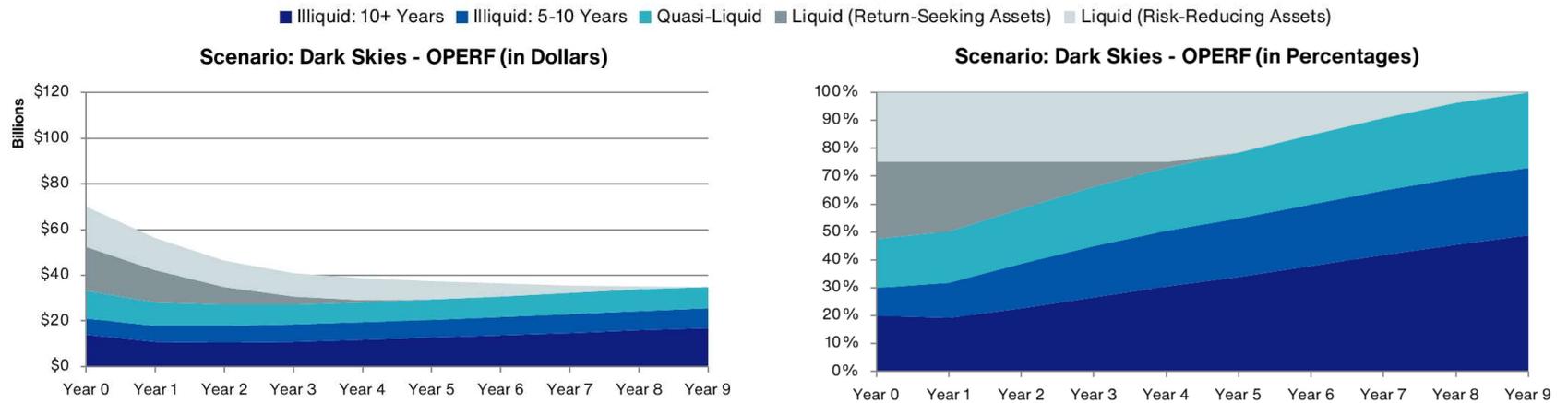
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Dark Skies economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Dark Skies economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 100% of the Plan due to the shrinking market value of the total Plan in this scenario
- In this scenario, the OIC may want to pare back future commitments to stay closer to the target allocations; however, the allocation would still be significantly different from the target allocation (47.5% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Dark Skies economic scenario – Option 2A (75% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2A allocation in the Dark Skies economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	25%	25%	25%	25%	25%	21%	15%	9%	4%	0%
Liquid Return-Seeking	28	25	17	9	2	0	0	0	0	0
Total Liquid	53%	50%	42%	34%	27%	21%	15%	9%	4%	0%
Quasi-Liquid	18%	18%	20%	21%	23%	24%	25%	26%	27%	27%
Illiquid: 5-10 Year Lock-up	10	13	16	18	20	21	22	23	24	24
Illiquid: 10+ Year Lock-up	20	19	23	27	30	34	38	42	45	49
Total Quasi + Illiquid	48%	50%	58%	66%	73%	79%	85%	91%	96%	100%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	55%	45%	39%	36%	35%	33%	32%	31%	31%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.4	\$4.0	\$4.6	\$5.1	\$5.5	\$5.9	\$6.4

Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Option 2B (72.5% R-S)

Section: Appendix

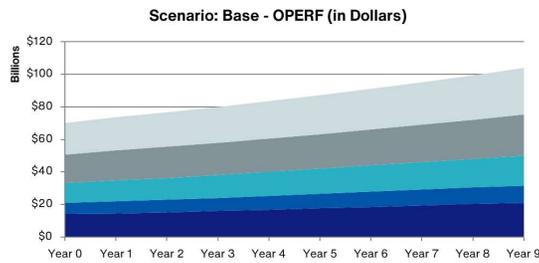


Liquidity Analysis

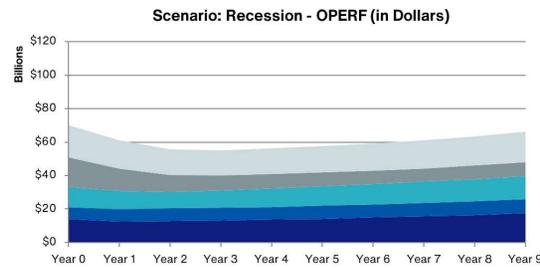
Option 2B (72.5% Return-Seeking)

■ Illiquid: 10+ Years
 ■ Illiquid: 5-10 Years
 ■ Quasi-Liquid
 ■ Liquid (Return-Seeking Assets)
 ■ Liquid (Risk-Reducing Assets)

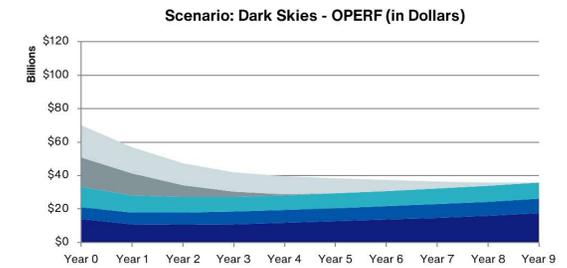
Base Case



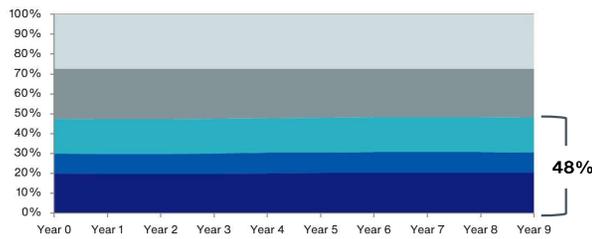
Recession



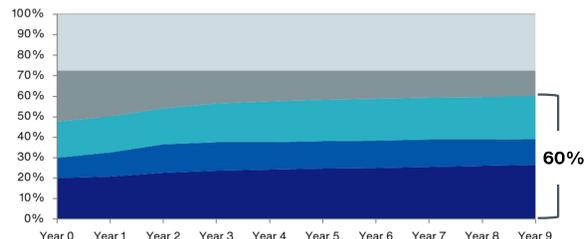
Dark Skies



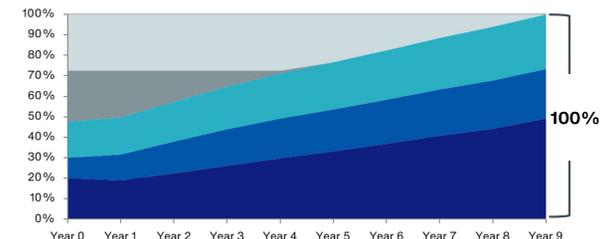
Scenario: Base - OPERF (in Percentages)



Scenario: Recession - OPERF (in Percentages)



Scenario: Dark Skies - OPERF (in Percentages)



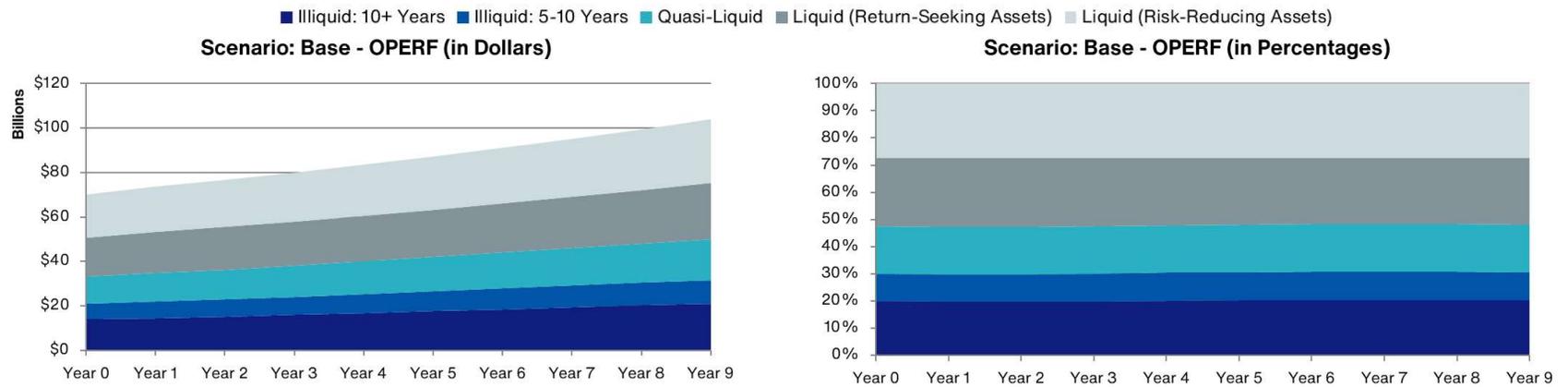
Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Base Case economic scenario, assuming commitments are continued as expected



Key Takeaway:

- Total illiquid and quasi-liquid assets are projected to stay near 47.5% of the Plan and can be maintained near the target with no cash flow problems

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Base Case economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Base Case economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	28%	28%	28%	28%	28%	28%	28%	28%	28%	28%
Liquid Return-Seeking	25	25	25	25	25	24	24	24	24	25
Total Liquid	53%	53%	53%	52%						
Quasi-Liquid	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Illiquid: 5-10 Year Lock-up	10	10	10	10	10	10	10	10	10	10
Illiquid: 10+ Year Lock-up	20	20	20	20	20	20	20	20	20	20
Total Quasi + Illiquid	48%	47%	47%	48%						

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	72%	73%	75%	76%	78%	80%	82%	85%	87%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.1	\$3.3	\$3.8	\$4.3	\$4.5	\$4.6	\$4.7

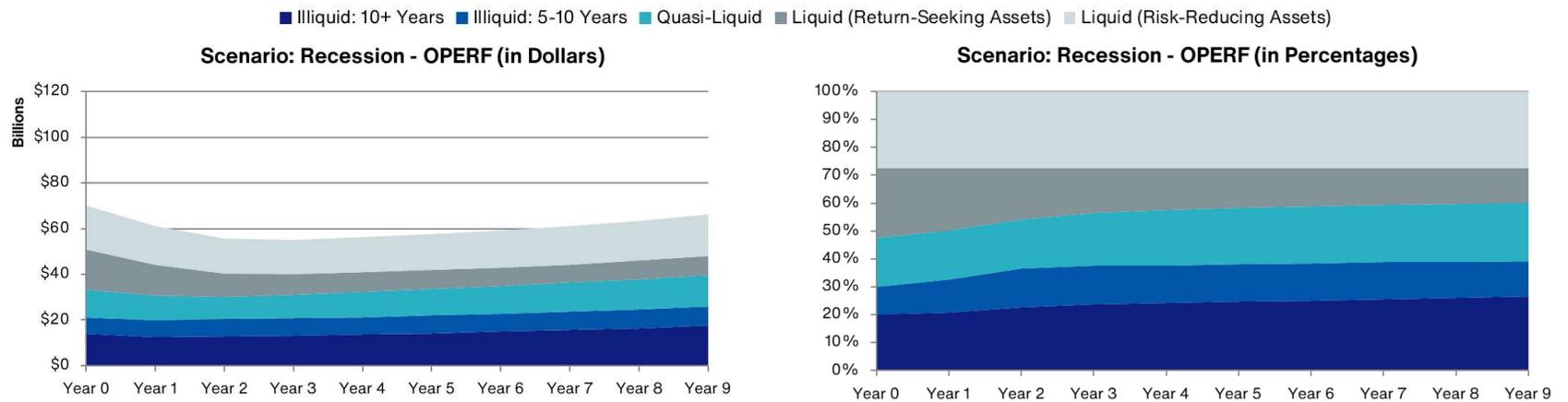
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Recession economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Recession economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 60% of the Plan due to the shrinking market value of the total Plan in this scenario
- There would not be a concern with the ability to pay benefits
- The OIC may need to redeem some quasi-liquid assets to stay close to its target allocation (47.5% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Recession economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Recession economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	28%	28%	28%	28%	28%	28%	28%	28%	28%	28%
Liquid Return-Seeking	25	22	18	16	15	14	14	13	13	12
Total Liquid	53%	50%	46%	44%	43%	42%	41%	41%	40%	40%
Quasi-Liquid	18%	17%	18%	19%	20%	20%	20%	21%	21%	21%
Illiquid: 5-10 Year Lock-up	10	12	14	14	14	13	13	13	13	13
Illiquid: 10+ Year Lock-up	20	21	23	24	24	25	25	26	26	27
Total Quasi + Illiquid	48%	50%	54%	56%	57%	58%	59%	59%	60%	60%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	60%	53%	52%	52%	53%	53%	54%	56%	57%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$3.0	\$3.5	\$4.1	\$4.7	\$5.2	\$5.8	\$6.3	\$6.7

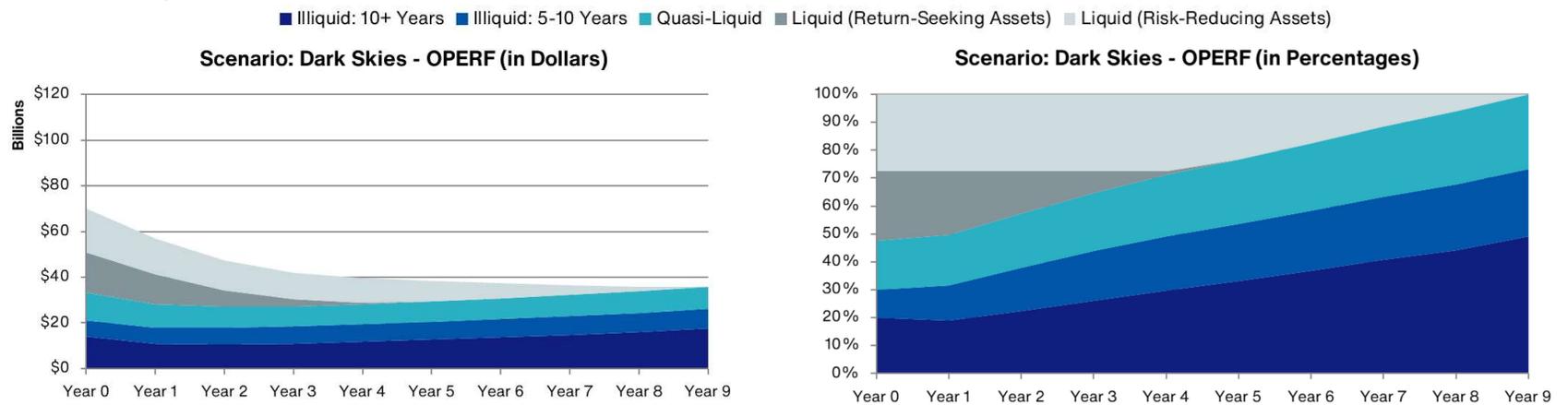
Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Liquidity Analysis

Dark Skies economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Dark Skies economic scenario, assuming commitments are continued as expected



Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid and quasi-liquid assets are projected to reach as high as 100% of the Plan due to the shrinking market value of the total Plan in this scenario
- In this scenario, the OIC may want to pare back future commitments to stay closer to the target allocations; however, the allocation would still be significantly different from the target allocation (47.5% illiquid assets)

Note: Year 0 represents a starting point of June 30, 2022



Liquidity Analysis

Dark Skies economic scenario – Option 2B (72.5% R-S)

The exhibit below shows the projected liquidity lock-up of the Option 2B allocation in the Dark Skies economic scenario, assuming commitments are continued as expected

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Risk-Reducing Assets	28%	28%	28%	28%	28%	23%	18%	12%	6%	0%
Liquid Return-Seeking	25	23	15	8	1	0	0	0	0	0
Total Liquid	53%	50%	43%	35%	29%	23%	18%	12%	6%	0%
Quasi-Liquid	18%	18%	19%	21%	22%	23%	24%	25%	26%	27%
Illiquid: 5-10 Year Lock-up	10	13	16	18	19	20	21	23	23	24
Illiquid: 10+ Year Lock-up	20	19	22	26	30	33	37	41	44	49
Total Quasi + Illiquid	48%	50%	57%	65%	71%	77%	82%	88%	94%	100%

Other Metrics	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Funded Ratio (MVA / AL)	70%	56%	46%	40%	37%	36%	34%	33%	32%	32%
Total Contribution Amt (in \$B)	\$2.5	\$2.7	\$2.9	\$3.4	\$4.0	\$4.6	\$5.1	\$5.5	\$5.9	\$6.4

Note: Year 0 represents a starting point of June 30, 2022; Percentages may not sum to 100% due to rounding



Assumptions and Methods

Section: Appendix



Liquidity Analysis

Assumptions

We started with the target asset allocations, then see how the actual allocations would change in different economic scenarios, continuing new commitments to private assets, as expected.

Actuarial projections provided by the plan actuary (Milliman) based on the unique economic scenario assumptions

- Milliman's projections are based on the same information used for results provided to Meketa and Oregon State Treasury (OST) on August 22, 2022. This reflects the same model used for our financial modeling presentation to the PERS Board at their December 2021 meeting, and that presentation should be referenced for information on the data, assumptions, methods, reliance, and disclaimers regarding the model. Known 2021 full-year OPERF returns and inflation were incorporated for all purposes and the deterministic scenarios Aon provided was used for calendar years 2022 through 2031.
- Please note that throughout Milliman's projection the valuation interest is assumed to remain at the current Board-adopted 6.90% for all scenarios and allocations.

Asset experience through June 30, 2022 (assumed to be a -8% year-to-date return) included in this analysis

Assets modeled in this analysis do not include side accounts

Assumes the portfolio starts at the target asset allocation levels for illiquid assets, maintaining close to the portfolio targets over the next 10 years

Our Capital Market Assumptions

As of June 30, 2022 (30 Years)

	Expected Real Return ¹	Expected Nominal Return ¹	Expected Nominal Volatility
Equity			
1 Global Equity IMI	5.3%	7.8%	18.5%
Fixed Income			
2 Core Fixed Income	1.3%	3.7%	4.5%
Alternatives			
3 Hedge Funds - CTAs	3.5%	6.0%	15.5%
4 Hedge Funds - Global Macro	3.0%	5.5%	12.5%
5 Alternative Risk Premia	5.0%	7.5%	9.5%
6 Risk Parity	3.9%	6.4%	10.5%
7 Core Real Estate	2.6%	5.1%	15.5%
8 Non-Core Real Estate	4.2%	6.7%	25.5%
9 Private Equity	7.6%	10.2%	25.5%
10 Infrastructure	5.2%	7.7%	15.0%
Inflation			
11 Inflation	0.0%	2.4%	2.0%

¹ Expected returns are using Aon Investments Q3 2022 30-Year Capital Market Assumptions. Assumptions do not include fees/expenses. All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Expected returns presented are models and do not represent the returns of an actual client account. Not a guarantee of future results.



Our Capital Market Assumptions

As of June 30, 2022

	Nominal Correlations	1	2	3	4	5	6	7	8	9	10	11
1	Global Equity IMI	1.00	0.02	0.16	0.23	0.32	0.75	0.36	0.47	0.63	0.35	0.08
2	Core Fixed Income	0.02	1.00	-0.03	0.14	0.08	0.42	0.05	0.04	0.03	0.05	-0.02
3	Hedge Funds - CTAs	0.16	-0.03	1.00	0.70	0.06	0.10	0.03	0.05	0.07	0.03	-0.02
4	Hedge Funds - Global Macro	0.23	0.14	0.70	1.00	0.09	0.28	0.06	0.09	0.11	0.06	0.01
5	Alternative Risk Premia	0.32	0.08	0.06	0.09	1.00	0.26	0.13	0.17	0.21	0.13	0.07
6	Risk Parity	0.75	0.42	0.10	0.28	0.26	1.00	0.23	0.32	0.37	0.23	0.18
7	Core Real Estate	0.36	0.05	0.03	0.06	0.13	0.23	1.00	0.97	0.32	0.18	0.06
8	Non-Core Real Estate	0.47	0.04	0.05	0.09	0.17	0.32	0.97	1.00	0.37	0.22	0.07
9	Private Equity	0.63	0.03	0.07	0.11	0.21	0.37	0.32	0.37	1.00	0.32	0.06
10	Infrastructure	0.35	0.05	0.03	0.06	0.13	0.23	0.18	0.22	0.32	1.00	0.06
11	Inflation	0.08	-0.02	-0.02	0.01	0.07	0.18	0.06	0.07	0.06	0.06	1.00



Aon's Capital Market Assumptions

Background

Long-term (10- and 30-year forecasts) forward-looking assumptions (asset class geometric return, volatility, and correlations)

Building Block approach, primarily based on consensus expectations and market-based inputs

Best estimates of annualized returns (50/50 better or worse)

Market returns: no active management value added (except for certain assets classes, such as hedge funds)

Net of investment fees

Updated quarterly

We show Aon's long-term (i.e., 30-year) capital market assumptions throughout this material



Aon's Capital Market Assumption Framework

Building Block Approach

Expected return estimates for equity and fixed income are developed using a building block approach

Expected returns based on observable information in the equity and fixed income markets and consensus estimates for major economic and capital market inputs, such as earnings and inflation

Where necessary, judgment-based modifications are made to these inputs

Return assumptions for other asset classes are based on historical results, current market characteristics, and professional judgment from our specialist research teams

Example: Public Equities



Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

The following capital market assumptions were developed by Aon's Global Asset Allocation Team and represent the long-term capital market outlook (i.e., 30 years) based on data at the end of the second quarter of 2022. The assumptions were developed using a building block approach, reflecting observable inflation and interest rate information available in the fixed income markets as well as Consensus Economics forecasts. Our long-term assumptions for other asset classes are based on historical results, current market characteristics, and our professional judgment.

Inflation – Expected Level (2.4%)

Based on Consensus Economics long-term estimates and our near-term economic outlook, we expect U.S. consumer price inflation to be approximately 2.4% during the next 30 years.

Real Returns for Asset Classes

Fixed Income

- **Cash (0.5%)** – Over the long run, we expect the real yield on cash and money market instruments to produce a real return of 0.5% in a moderate to low-inflationary environment.
- **TIPS (1.0%)** – We expect intermediate duration Treasury Inflation-Protected Securities to produce a real return of about 0.0%.
- **Core Fixed Income (i.e., Market Duration) (1.3%)** – We expect intermediate duration Treasuries to produce a real return of about 0.5%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 0.8%, resulting in a long-term real return of 1.3%.
- **Core Plus Bonds (1.7%)** – Modeled as 20% 5 duration gov't with real return of 0.5% and 80% 5 duration corporate bonds with real return of 2.0%.
- **Long Duration Bonds – Government and Credit (1.9%)** – We expect Treasuries with a duration comparable to the Long Government Credit Index to produce a real return of 1.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 0.8%, resulting in an expected real return of 1.9%.

Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

- **Long Duration Bonds – Credit (2.4%)** – We expect Treasuries with a duration comparable to the Long Credit Index to produce a real return of 1.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 1.3%, resulting in an expected real return of 2.4%.
- **Long Duration Bonds – Government (1.1%)** – We expect Treasuries with a duration of ~12 years to produce a real return of 1.1% during the next 30 years.
- **High Yield Bonds (3.3%)** – We expect intermediate duration Treasuries to produce a real return of about 0.5%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 2.8%, resulting in an expected real return of 3.3%.
- **Bank Loans (3.7%)** – We expect LIBOR to produce a real return of about 1.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults) to be 2.6%, resulting in an expected real return of 3.7%.
- **Non-US Developed Bonds: 50% Hedged (0.9%)** – We forecast real returns for non-US developed market bonds to be 0.9% over a 30-year period after adjusting for a 50% currency hedge. We assume a blend of one-third investment grade corporate bonds and two-thirds government bonds. We also produce assumptions for 0% hedged and 100% hedged non-US developed bonds.
- **Emerging Market Bonds (Sovereign; USD) (3.3%)** – We forecast real returns for emerging market sovereign bonds denominated in US dollars to be 3.3% over a 30-year period.
- **Emerging Market Bonds (Corporate; USD) (2.7%)** – We forecast real returns for emerging market corporate bonds denominated in US dollars to be 2.7% over a 30-year period.
- **Emerging Market Bonds (Sovereign; Local) (3.9%)** – We forecast real returns for emerging market sovereign bonds denominated in local currency to be 3.9% over a 30-year period.
- **Multi Asset Credit (MAC) (4.4%)** – We assume real returns from beta exposure to high yield, bank loans and emerging market debt to add 3.6% plus 0.8% from alpha (net of fees) over a 30-year period.



Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

- **Private Debt-Direct Lending (4.6%)** – The base building block is bank loans 3.7% + spread 0.9% (net of management fees and performance incentives). There is 100% leverage included in the assumption with the nominal cost of financing at LIBOR + 2.5%.

Equities

- **Large Cap U.S. Equity (4.8%)** – This assumption is based on our 30-year outlook for large cap U.S. company dividends and real earnings growth. Adjustments are made for valuations as needed.
- **Small Cap U.S. Equity (5.3%)** – Adding a 0.5% return premium for small cap U.S. equity over large cap U.S. equity results in an expected real return of 5.3%. This return premium is theoretically justified by the higher risk inherent in small cap U.S. equity versus large cap U.S. equity, and is also justified by historical data. In recent years, higher small cap valuations relative large cap equity has reduced the small cap premium.
- **Global Equity (Developed & Emerging Markets) (5.3%)** – We employ a building block process similar to the U.S. equity model using the developed and emerging markets that comprise the MSCI All-Country World Index. Our roll-up model produces an expected real return of 5.3% for global equity.
- **International (Non-U.S.) Equity, Developed Markets (5.1%)** – We employ a building block process similar to the U.S. equity model using the non-U.S. developed equity markets that comprise the MSCI EAFE Index.
- **Emerging Market Stocks (5.7%)** - We employ a building block process similar to the U.S. equity model using the non-U.S. emerging equity markets that comprise the MSCI Emerging Markets Index.
- **Equity Risk Insurance Premium Strategies-High Beta (3.8%)** – We expect real returns from 50% equity + 50% cash beta of 3.0% plus 0.8% insurance risk premium over the next 30 years.

Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

Alternative Asset Classes

- **Hedge Fund-of-Funds Universe (2.1%)** – The generic category “hedge funds” encompasses a wide range of strategies accessed through “fund-of-funds” vehicles. We also assume the *median* manager is selected and also allow for the additional costs associated with Fund-of-Funds management. A top-tier portfolio of funds (hedge fund-of-funds buy-list) could add an additional 1.1% in return at similar volatility based on alpha, lower fees and better risk management.
- **Hedge Fund-of-Funds Buy List (3.2%)** – The generic category of top-tier “hedge funds” encompasses a wide range of strategies accessed through “fund-of-funds” vehicles. We assume additional costs associated with Funds-of-Funds management. To use this category the funds must be buy rated or we advise on manager selection.
- **Broad Hedge Funds Universe (3.5%)** – Represents a diversified portfolio of direct hedge fund investments. This investment will tend to be less diversified than a typical “fund-of-funds” strategy as there will be fewer underlying managers and will not include the extra layer of fees found in a Fund-of-Funds structure.
- **Broad Hedge Funds Buy List (4.8%)** – Represents a diversified portfolio of top-tier direct hedge fund investments. This investment will tend to be less diversified than a typical “fund-of-funds” strategy as there will be fewer underlying managers and will not include the extra layer of fees found in a Fund-of-Funds structure. To use this category the funds must be buy rated or we advise on manager selection.
- **Core Real Estate (2.6%)** -- Our real return assumption for core real estate is based a gross income of about 2.6%, management fees of roughly 1%, 25% leverage and future capital appreciation near the rate of inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property and by geographic region.
- **Non-Core Real Estate (4.2%)** -- Core real estate is levered approximately 100% as the base building block for this assumption. We subtract financing costs for the leverage and 2% management costs. We also assume nominal alpha of 3% over core real estate. We assume a 50/50 mix of value-add and opportunistic investments.

Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

- **U.S. REITs (3.9%)** – Our real return assumption for U.S. REITs is based on income of about 3.9% and future capital appreciation near the rate of inflation during the next 30 years. REITs are a sub-set of U.S. small/mid cap equity universe.
- **Commodities (3.5%)** – Our commodity assumption is for a diversified portfolio of commodity futures contracts. Commodity futures returns are composed of three parts: spot price appreciation, collateral return, and roll return (positive or negative change implied by the shape of the future curve). We believe that spot prices will converge with CPI over the long run (i.e., 2.4%). Collateral is assumed to be LIBOR cash (1.1%). Also, we believe the roll effect will be near zero, resulting in a real return of about 3.5% for commodities.
- **Private Equity (7.6%)** – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.
- **Infrastructure (5.2%)** – Our infrastructure assumption is formulated using a cash flow based approach that projects cash flows (on a diversified portfolio of assets) over a 30-year period. Income and capital growth as well as gearing levels, debt costs and terms, relevant tax and management expenses are all taken into consideration. Our approach produces an expected real return of 5.2% for infrastructure.
- **Equity Risk Insurance Premium Strategies-Low Beta (2.9%)** – We assume real returns from cash of 0.5% + 2.4% from alpha.
- **Alternative Risk Premia (ARP) (5.0%)** – Real return target LIBOR 1.1% plus 3.9% alpha (net of fees)
- **eLDI (2.8%)** – Combination of various long credit strategies (1/6 real estate debt, 1/3 securitized debt, 1/6 CMOs, 1/3 private placements)
- **Closed-End Real Assets (5.5%)** – Modeled as 50% Non-Core Real Estate and 50% Infrastructure

Explanation of Capital Market Assumptions

As of June 30, 2022 (30 Years)

Volatility / Correlation Assumptions

Assumed volatilities are formulated with reference to implied volatilities priced into option contracts of various terms, as well as with regard to historical volatility levels. For asset classes which are not marked to market (for example real estate), we “de-smooth” historical returns before calculating volatilities. Importantly, we consider expected volatility trends in the future – in recent years we assumed the re-emergence of an economic cycle and a loss of confidence in central bankers would lead to an increase in volatility. Correlation assumptions are generally similar to actual historical results; however, we do make adjustments to reflect our forward-looking views as well as current market fundamentals.

Economic Scenarios

Section: Appendix

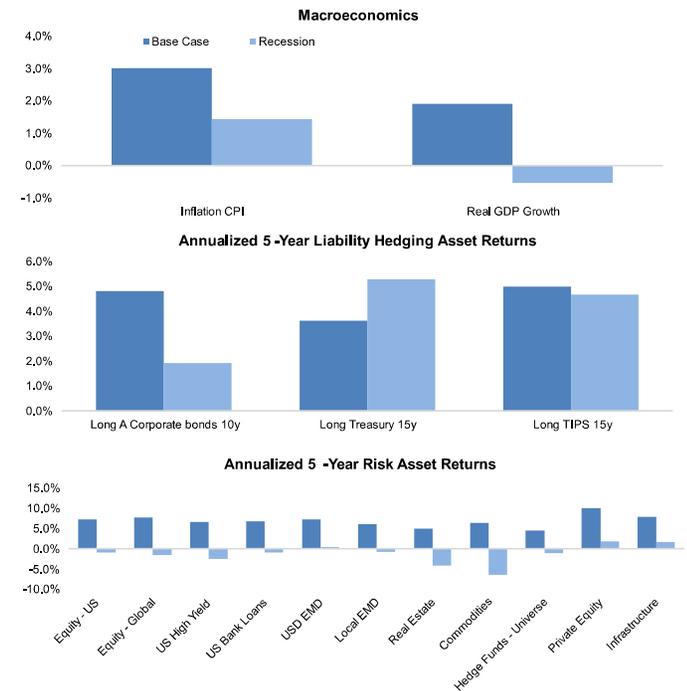


Recession Scenario

Description

The US economy slips back into recession in 2022/2023

- Global growth is much weaker than the base case. Concerns that inflation will remain high for longer lead to central banks rapidly tightening monetary policies.
- Tightening financial conditions, combined with spillover effects from geopolitical volatility and reduced consumer and business spending, as real incomes are squeezed by high inflation, lead to a deep recession in the US in 2022/23.
- The economic slowdown leads to developed economies implementing modest fiscal stimulus measures and monetary policy becomes more accommodative. Policy actions are only partially effective as they are tackling the demand side of the equation.
- Inflation is lower than the base case. However, inflation starts to rise in later years as the post-recession recovery gets underway.
- Treasury yields fall while TIPS yields remain at low levels as the US enters recession. Yields rise in later years as a recovery gets underway. Corporate spreads rise significantly due to the poor economic situation and increased risks of downgrades or defaults.
- Most risk assets make losses in the first two years but rebound in later years as the economy recovers.



Returns from 30 June 2022
Source: Aon

The opinions referenced are as of the date of publication and are subject to change due to changes in the market or economic conditions and may not necessarily come to pass. Information contained herein is for informational purposes only and should not be considered investment advice.



Recession Scenario

Data

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Yields (BOY)											
Treasury yield 5y	3.0%	0.8%	0.6%	1.3%	1.6%	1.9%	1.9%	2.0%	2.1%	2.2%	2.4%
Long Treasury yield 15y	3.2%	1.0%	0.9%	1.8%	2.1%	2.4%	2.5%	2.6%	2.7%	2.8%	2.8%
TIPS yield 5y	0.6%	-1.0%	-1.1%	-0.6%	-0.5%	-0.3%	-0.3%	-0.2%	0.0%	0.2%	0.5%
Long TIPS yield 15y	1.0%	-0.7%	-0.8%	-0.2%	0.0%	0.1%	0.3%	0.4%	0.5%	0.7%	0.8%
Breakeven price inflation 15y	2.2%	1.7%	1.7%	2.0%	2.1%	2.2%	2.2%	2.2%	2.2%	2.1%	2.0%
A Corporate bond yield 5y	4.5%	5.0%	5.5%	5.5%	5.1%	5.1%	4.9%	4.7%	4.5%	4.4%	4.4%
Long A Corporate bond yield 10y	4.6%	4.5%	4.8%	5.2%	5.0%	4.9%	4.9%	5.0%	5.0%	5.1%	5.1%
A Corporate spread 5y	1.5%	4.3%	4.9%	4.2%	3.6%	3.2%	3.0%	2.7%	2.5%	2.2%	2.0%
Long A Corporate spread 10y	1.4%	3.6%	4.1%	3.7%	3.2%	3.0%	2.8%	2.6%	2.4%	2.3%	2.1%
Expected nominal return on assets											
Equity – US	-17.2%	-9.1%	11.5%	6.6%	6.6%	6.7%	6.7%	6.8%	6.9%	6.9%	6.9%
Equity – Global	-19.6%	-10.5%	12.5%	7.0%	7.0%	7.0%	7.1%	7.2%	7.2%	7.2%	7.3%
A Corporate bonds 5y	2.1%	1.4%	3.3%	5.4%	4.2%	4.2%	4.8%	4.7%	4.5%	4.3%	4.2%
Long A Corporate bonds 10y	3.7%	-1.1%	-1.7%	5.6%	3.2%	3.5%	3.9%	4.1%	4.6%	4.6%	4.8%
Treasury 5y	13.1%	1.7%	-1.6%	0.5%	0.9%	2.1%	2.1%	2.0%	2.0%	2.0%	1.9%
Long Treasury 15y	40.3%	3.9%	-10.5%	-0.3%	-0.5%	1.8%	2.0%	2.2%	2.3%	2.1%	2.1%
TIPS 5y	9.9%	1.0%	-1.7%	0.1%	0.4%	1.0%	1.1%	1.1%	1.2%	1.2%	1.4%
Long TIPS 15y	32.4%	2.6%	-7.6%	0.0%	0.0%	0.8%	0.9%	1.0%	0.9%	0.9%	1.1%
US High Yield	-15.3%	-11.8%	7.2%	5.4%	4.0%	5.4%	5.4%	5.3%	5.4%	5.4%	5.3%
Bank Loans	-10.2%	-7.1%	6.3%	3.7%	3.6%	3.9%	4.2%	4.5%	4.7%	4.7%	4.9%
USD Emerging Market Debt	-11.2%	-6.9%	9.2%	6.4%	6.2%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
Local Emerging Market Debt	-12.4%	-8.1%	8.0%	5.3%	5.0%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%
Real Estate	-13.2%	-8.1%	-3.0%	0.5%	4.4%	4.4%	4.5%	4.6%	4.6%	4.6%	4.7%
Commodities	-26.0%	-20.1%	8.9%	5.5%	5.5%	5.6%	5.6%	5.7%	5.8%	5.8%	5.9%
Hedge Funds - FoHF – Universe	-13.4%	-8.2%	7.4%	6.2%	4.4%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Private Equity	-19.8%	-9.9%	14.7%	9.2%	9.2%	9.2%	9.3%	9.4%	9.5%	9.5%	9.5%
Infrastructure - US	-4.9%	-0.6%	2.9%	3.7%	7.3%	7.4%	7.4%	7.5%	7.5%	7.5%	7.5%
Cash	2.8%	0.3%	0.4%	0.8%	1.1%	1.2%	1.4%	1.6%	1.7%	1.7%	1.8%
CPI	2.4%	1.5%	0.8%	1.1%	1.4%	1.5%	1.6%	1.7%	1.8%	1.8%	1.9%

Scenario information as of June 30, 2022



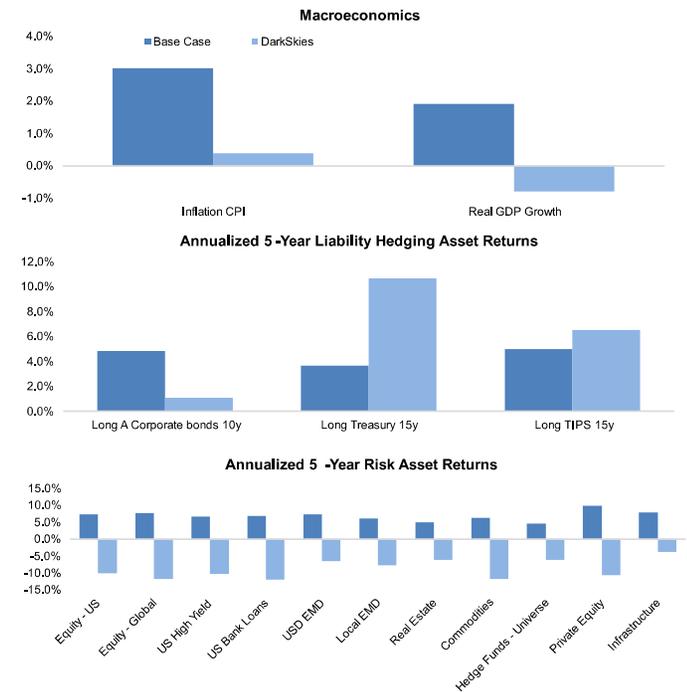
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Dark Skies Scenario

Description

A deep recession followed by a longer period of stagnant growth

- A worsening Russia-Ukraine war, which expands beyond Ukraine’s borders, and a renewed flare up of the pandemic, disrupts to the global economy, as additional restrictions are required over the next few years. China experiences a sharp deterioration in economic growth, due to stricter Covid restrictions and structural issues.
- Worsening geopolitical instability and central banks’ aggressive monetary tightening has a severe impact on world economic growth. Economic weakness in developed and emerging market economies and severe levels of financial distress (due to high debt levels and political crisis) lead to a global recession followed by stagnation.
- Inflation falls sharply in 2022 and sluggish growth over the following years means that inflation stays low.
- Treasury yields fall and remain at low levels as the US enters recession. Corporate spreads rise significantly due to the poor economic situation and increased risks of downgrades or defaults.
- Risk assets make losses in the first few years. There is no pronounced bounce in growth and the economic situation remains poor for a long time, which weighs on returns in later years.



Returns from 30 June 2022
Source: Aon

The opinions referenced are as of the date of publication and are subject to change due to changes in the market or economic conditions and may not necessarily come to pass. Information contained herein is for informational purposes only and should not be considered investment advice.



Dark Skies Scenario

Data

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Yields (BOY)											
Treasury yield 5y	3.0%	0.2%	-0.6%	-0.7%	-0.7%	-0.5%	-0.2%	0.0%	0.3%	0.6%	0.9%
Long Treasury yield 15y	3.2%	0.4%	-0.1%	-0.2%	-0.1%	0.0%	0.3%	0.6%	0.9%	1.2%	1.4%
TIPS yield 5y	0.6%	-1.1%	-1.7%	-1.9%	-1.8%	-1.7%	-1.5%	-1.3%	-1.1%	-0.8%	-0.4%
Long TIPS yield 15y	1.0%	-1.1%	-1.5%	-1.6%	-1.5%	-1.4%	-1.2%	-0.9%	-0.7%	-0.4%	-0.2%
Breakeven price inflation 15y	2.2%	1.5%	1.4%	1.4%	1.4%	1.4%	1.5%	1.6%	1.6%	1.6%	1.6%
A Corporate bond yield 5y	4.5%	5.8%	5.6%	5.2%	4.6%	4.3%	4.2%	4.1%	4.1%	4.0%	4.0%
Long A Corporate bond yield 10y	4.6%	4.9%	4.8%	4.5%	4.1%	3.9%	4.0%	4.1%	4.2%	4.3%	4.4%
A Corporate spread 5y	1.5%	5.6%	6.2%	5.9%	5.2%	4.8%	4.4%	4.1%	3.8%	3.4%	3.1%
Long A Corporate spread 10y	1.4%	4.6%	5.0%	4.8%	4.4%	4.0%	3.8%	3.6%	3.3%	3.1%	2.9%
Expected nominal return on assets											
Equity – US		-26.2%	-18.6%	-9.8%	3.7%	3.7%	4.0%	4.4%	4.7%	5.1%	5.5%
Equity – Global		-29.5%	-21.0%	-11.1%	3.7%	3.7%	4.1%	4.5%	4.9%	5.3%	5.7%
A Corporate bonds 5y		-1.9%	1.7%	1.5%	2.2%	0.9%	0.3%	0.8%	1.2%	1.6%	1.9%
Long A Corporate bonds 10y		-1.0%	0.4%	1.8%	3.1%	1.1%	-0.4%	0.2%	0.7%	1.3%	1.8%
Treasury 5y		15.5%	3.6%	-0.4%	-1.0%	-1.4%	-1.8%	-1.5%	-1.2%	-1.0%	-0.7%
Long Treasury 15y		52.5%	8.9%	1.7%	-0.3%	-1.5%	-3.2%	-2.8%	-2.5%	-2.1%	-2.0%
TIPS 5y		8.8%	1.2%	-1.3%	-2.0%	-2.1%	-2.0%	-1.7%	-1.4%	-1.1%	-0.7%
Long TIPS 15y		37.0%	4.8%	-0.1%	-2.1%	-2.4%	-3.6%	-3.2%	-3.0%	-2.7%	-2.4%
US High Yield		-19.6%	-15.2%	-11.2%	-1.6%	-2.9%	-3.1%	-2.1%	-1.1%	-0.2%	0.6%
Bank Loans		-23.3%	-19.9%	-12.5%	-0.8%	-1.1%	-0.5%	0.2%	0.9%	1.6%	2.2%
USD Emerging Market Debt		-17.2%	-12.4%	-6.9%	2.9%	2.4%	2.4%	2.9%	3.4%	3.8%	4.3%
Local Emerging Market Debt		-18.4%	-13.6%	-8.0%	1.8%	1.2%	1.2%	1.7%	2.2%	2.7%	3.1%
Real Estate		-14.9%	-10.5%	-4.9%	-0.6%	1.5%	1.9%	2.2%	2.6%	2.9%	3.2%
Commodities		-33.1%	-25.1%	-1.6%	4.1%	4.1%	4.3%	4.5%	4.7%	5.0%	5.2%
Hedge Funds - FoHF – Universe		-16.3%	-11.1%	-5.5%	1.5%	1.5%	1.8%	2.1%	2.4%	2.7%	3.0%
Private Equity		-30.6%	-21.4%	-10.5%	5.6%	5.6%	6.0%	6.5%	6.9%	7.3%	7.8%
Infrastructure - US		-11.8%	-7.5%	-3.7%	1.3%	3.9%	4.3%	4.7%	5.0%	5.4%	5.8%
Cash		2.8%	-0.1%	-0.5%	-0.6%	-0.5%	-0.3%	-0.1%	0.2%	0.4%	0.7%
CPI		1.0%	-0.2%	0.2%	0.4%	0.6%	0.8%	0.9%	1.1%	1.3%	1.5%

Scenario information as of June 30, 2022



About This Material

Section: Appendix



About This Material

This material includes a summary of calculations and consulting related to the finances of the Oregon Public Employees Retirement Fund (OPERF). The following variables have been addressed:

- Contributions, Liquidity, Net Outflow

This analysis is intended to assist the Investment Committee with a review of the associated issues and options, and its use may not be appropriate for other purposes. This analysis has been prepared solely for the benefit of the Investment Committee. Any further dissemination of this report is not allowed without the written consent of Aon Investments USA Inc.

Our calculations were generally based on the methodologies identified in the actuary's valuation report for OPERF. We believe the methodology used in these calculations conforms to the applicable standards identified in the report.

Models are used to develop alternative scenarios based on the underlying valuation model and project financial results under those scenarios. The models were developed by experts outside and within Aon. Where outside models were used, the models were reviewed by experts within Aon. The models were selected as appropriate for these projections by the undersigned.

Experience different than anticipated could have a material impact on the ultimate costs of the benefits. In addition, changes in plan provisions or applicable laws could have a significant impact on cost. Actual experience may differ from our modeling assumptions.

Our calculations were based on data provided by the plan actuary. The actuarial assumptions and methods and plan provisions reflected in these projections are the same as those used for the 2021 actuarial valuation for OPERF as noted in the actuarial reports, except where noted in this report. Unless specifically noted, our calculations do not reflect any other changes or events after December 31, 2021. Reflecting events after December 31, 2021 would impact the results of the projection.

In conducting these projections, we have relied on plan design, demographic and financial information provided by other parties, including the plan's actuary and plan sponsor. While we cannot verify the accuracy of all of the information, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy or completeness of the information and believe that it has produced appropriate results.

These projections have been conducted in accordance with generally accepted actuarial principles and practices, including applicable Actuarial Standards of Practice as issued by the Actuarial Standards Board. The undersigned actuary is familiar with the near-term and long-term aspects of pension valuations and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein. All sections of this report are considered an integral part of the actuarial opinions.

To our knowledge, no colleague of Aon Investments USA Inc. providing services to OPERF has any direct financial interest or indirect material interest in OPERF. Thus, we believe there is no relationship existing that might affect our capacity to prepare and certify this report for OPERF.

Aon Investments USA Inc.

Phil Kivarkis, FSA, CFA



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INTRODUCTION & OVERVIEW

Summary Policy Statement

This Statement of Investment Objectives and Policy Framework (the "Statement") summarizes the philosophy, objectives and policies approved by the *Oregon Investment Council* (the "OIC" or the "Council") for the investment of *Oregon Public Employees Retirement Fund* ("OPERF" or the "Fund") assets.

1. The Statement has been prepared with six audiences in mind: 1) incumbent, new and prospective Council members; 2) *Oregon State Treasury* ("OST") staff; 3) the Public Employees Retirement Board ("PERB"); 4) active and retired Oregon Public Employees Retirement System (PERS) members; 5) the Oregon State Legislature and Governor; and 6) agents engaged by the Council to manage and administer Fund assets.
2. The Council approved these objectives and framework after careful consideration of PERS benefit provisions, and the implications of alternative objectives and policies.
3. The Statement summarizes more detailed policy and procedure documents prepared and maintained by staff, and numerous other documents that govern the day-to-day management of OPERF assets including agent agreements, individual investment manager mandates and limited partnership documents.
4. The Council regularly assesses the continued suitability of its approved investment objectives and policies, initiates change as necessary and updates these documents accordingly.

Applicability

Classified represented, management service, unclassified executive service.

Authority

ORS Chapter 293.

POLICY PROVISIONS

Definitions

Actuarial Discount Rate ("ADR"): The discount rate set by the PERB to calculate the present value of a defined benefit plan's future obligations and determine the size of the plan sponsor's annual contribution.

Asset Class: A collection of securities that have conceptually similar claims on income streams and have returns that are highly correlated with each other. The most frequently referenced asset classes include equities, fixed income, real estate and cash.

Basis Point: This refers to a common unit of financial measurement. One basis point equals 0.01%. One hundred basis points equal 1% or one percentage point.

Benchmark: A standard by which investment performance can be measured and evaluated. For example, the performance of U.S. equity managers is often measured and evaluated relative to the Russell 3000 Index. In this case, the Russell 3000 Index serves as or represents the U.S. equity benchmark.

Benchmark Exposure: The proportion that a given stock represents within a benchmark, such as the Russell 3000 Index of U.S. equity securities. Allows investors to measure the extent to which a portfolio or specific investment strategy is over- or under-exposed to a particular stock or investment characteristic (e.g., market capitalization) relative to a benchmark.

Bloomberg Barclays U.S. Aggregate Index: This index covers the U.S. investment-grade fixed rate bond market, and includes government, corporate, mortgage pass-through and asset-backed securities. These major sectors are subdivided into more specific indices that are calculated and reported on a regular basis. Its constituents are SEC-registered, taxable, dollar-denominated securities that conform to specific parameters.

~~*Bloomberg Barclays U.S. Treasury Index:* This index is a sub-component of the Bloomberg Barclays Aggregate Index and includes public obligations of the U.S. Treasury with remaining maturities of more than one year that conform to specific parameters.~~

Co-investment: Although used loosely to describe any two parties that invest alongside one another in the same company, this term has a special meaning in the context of an investment fund's limited partners. By having co-investment rights, a limited partner can invest directly in a company that is simultaneously backed by the fund's general partner. In this way, the limited partner has two separate stakes in the company: the first, an indirect investment through its participation in the general partner's fund; the second, a direct investment alongside the general partner. While the direct, co-investment opportunity is usually offered at terms and conditions more favorable than the fund investment, the direct, concentrated nature of the co-investment opportunity implies higher risk for the limited partner.

Core: Real estate investment strategies which exhibit "institutional" qualities, such as superior location, high occupancy and premium design and construction quality.

Credit: Used most often in a fixed income context, the measure of an organization's ability to re-pay borrowed money. Organizations with the highest credit rating (i.e., those most likely to re-pay borrowed money) are assigned a AAA credit rating.

Distressed Debt: A private equity investment strategy that involves purchasing discounted bonds of a ~~financially distressed~~ financially distressed firm. Distressed debt investors frequently convert their holdings into equity and become actively involved in the management of the distressed firm.

Diversification: Reducing risk without a commensurate reduction in expected return by combining assets and/or investment strategies with low or uncorrelated return and volatility profiles. For example, a decline in the price of one asset (e.g., oil stocks) is offset by an increase in the price of another asset (e.g., airline stocks). In lay terms, this principle is often described as "putting your eggs in more than one basket".

Diversifying Strategies: Investment strategies that attempt to generate returns that are independent of asset class ~~returns, and~~ returns and may include systematically capturing certain risk premia beyond traditional equity and fixed income market exposures.

Duration: A financial measure used by investors to estimate the price sensitivity of a fixed income security relative to changes in interest rates. For example, if interest rates increase by 1 percentage point, a ~~5-year duration~~ bond with a duration of 5 years will decline in price by approximately 5 percent.

Efficient Market: A market in which security prices rapidly reflect all information germane to the price discovery process. A primary implication of an efficient market is that active management efforts often fail to produce results that consistently beat the performance of an index fund or other passive strategy net of fees, transactions costs and other expenses.

Equities: Investments that represent ownership in a company and therefore a proportional share of company profits.

Fixed Income: Debt obligations that specify the precise repayment of previously borrowed money. Typically, repayment takes the form of a series of fixed-amount, semi-annual interest payments and a single, final repayment of principal.

Funded Status: A comparison of a pension plan's assets and liabilities where the latter are often referred

to as the plan's projected benefit obligation ("PBO"). When a plan's assets exceed its PBO, the plan is considered overfunded. Conversely, if a plan's assets are less than its PBO, the plan is considered underfunded and the plan sponsor has a net liability position with respect to its pension plan.

Fund-of-funds (FOFs): Often organized by an investment advisor or investment bank, a fund that invests in other funds rather than directly in securities, operating firms or other assets.

Growth Stock: Stocks exhibiting faster-than-average earnings growth with expectations that such growth will continue. Growth stocks usually have high price-to-earnings ratios, high price-to-book ratios and low to no dividend yields.

Hedge Fund Research Inc. Fund of Funds Conservative Index (HFRI FOF Conservative Index): The HFRI FOF Conservative Index is an investment performance composite published monthly by Hedge Fund Research, Inc. (HFRI). This index is a capitalization-weighted index of FOFs pursuing a "conservative" investment strategy and conforming to specific parameters. A fund in the HFRI FOF Conservative Index shows generally consistent performance regardless of market conditions.

Hedged: A term applied to one, more or an entire portfolio of assets indicating that the base country value of such assets is partially or wholly protected from foreign currency fluctuations. Forward currency contracts are typically used to hedge or offset the effects of these fluctuations.

Index Fund: A portfolio management strategy that seeks to match the composition and performance of a select index such as the Russell 3000 or S&P 500.

Leverage Buyout (LBO): A strategy in which debt financing is used to acquire a firm or business unit, typically in a mature industry. LBO debt is usually repaid according to a strict schedule that absorbs most of the acquired firm's cash flow.

Liability: A claim on assets by individuals or companies. In a pension context, liabilities represent the claim on fund assets by active and retired plan beneficiaries.

MSCI All Country World Investable Market Index (ACWI-IMI): A capitalization-weighted index that includes approximately 9,000 ~~publicly traded~~ publicly traded equity securities and is designed to measure equity market performance across developed and emerging markets. This index consists of over 40 separate developed and emerging market country indices.

~~*MSCI World Ex U.S. Index:* A subset of the MSCI All Country World Index that contains only securities from developed market countries, excluding those from the U.S.~~

Market Capitalization: The value of a corporation as determined by multiplying the price of its shares by the number of shares outstanding. In general, the share prices of smaller capitalized companies are more volatile than those of larger capitalized companies.

Mezzanine: Either a private equity financing undertaken shortly before an initial public offering, or an investment strategy that employs subordinated debt (which has fewer privileges than bank debt but more standing than equity) and often is issued with attached equity warrants.

NCREIF Fund Index – Open End Diversified Core Equity (NFI-ODCE): The NFI-ODCE is an investment performance composite published quarterly by the National Council of Real Estate Investment Fiduciaries (NCREIF). This index is a capitalization-weighted index of approximately 30 open-ended, commingled funds pursuing a "core" investment strategy and conform to specific parameters.

Oregon State Treasury: Headed by the State Treasurer, the Oregon State Treasury is responsible for managing the ~~day-to-day~~ day-to-day investment operations of the state pension fund (and other funds), issuing all state debt, and serving as the central bank for state agencies. Within the Oregon State Treasury, the Investment Division also manages investment programs for the state's deferred compensation and

college savings plans, and serves as staff to the Oregon Investment Council.

Opportunistic: Higher risk but higher expected return real estate investments that are usually illiquid, produce little or no current income and are often focused on distressed and/or highly leveraged properties.

Opportunity Portfolio: Includes non-traditional and/or concentrated investment strategies that may provide enhanced diversification and/or unique sources of return relative to the other asset classes included in the OIC's approved policy mix. The Opportunity Portfolio's objectives are pursued by investing in strategies that fall outside the boundaries of "strategic" or approved policy mix allocations including new or innovative strategies across a wide range of potential investment opportunities and with few limitations or constraints.

Oregon Investment Council: Oregon Revised Statutes ("ORS") 293.706 establishes the OIC, which consists of five voting members, four of whom are appointed by the Governor and subject to Senate confirmation (the Treasurer serves as an ex-officio member, and is therefore not subject to confirmation). The members appointed by the Governor must be qualified by training and experience in the field of investment or finance. In addition, the Director of the Oregon Public Employees Retirement System is a non-voting ex-officio member of the OIC. ORS 293.721 and 293.726 establish the OIC's investment objectives and standards of judgment and care.

Oregon Public Employees Retirement Fund: Holds the assets of beneficiaries of PERS, which is a state-wide, defined benefit retirement plan for units of state government, political subdivisions, community colleges and school districts. PERS is administered under ORS chapters 237, 238, 238A, and applicable provisions of the Internal Revenue Code by the PERB. Participation by state government units, school districts, and community colleges is mandatory. Participation by most political subdivisions is optional, but irrevocable if elected. All system assets accumulated for the payment of benefits may legally be used to pay benefits to any of the plan members or beneficiaries of the system. PERS is responsible for administering the management of the plan's liability and participant benefits.

Oregon Short Term Fund (OSTF): The state's commingled cash investment pool managed internally by Treasury staff. The OSTF includes all excess state agency cash, as required by law, as well as cash invested by local governments on a discretionary basis. The OSTF is invested in accordance with investment guidelines recommended by the state's Oregon Short Term Fund Board and approved by the OIC.

Overlay Manager: An investment advisor retained by the OIC to monitor daily cash balances in OPERF and execute trades in the equity and fixed income futures markets to adjust OPERF's overall asset allocation closer to its OIC-approved targets.

Overweight: A stock, sector or capitalization exposure that is higher than the corresponding exposure in a given asset class benchmark, such as the Russell 3000 Index.

Private Equity: ~~Venture Economics ("VE") uses the term to describe the universe of all venture investing, buyout investing and mezzanine investing. Fund-of-funds investing and secondaries are also included in this term's broadest interpretation. VE is not using the term to include angel investors or business angels, real estate investments or other investing scenarios outside of the public market. A broad category of investments in private companies that includes leverage buyouts, mezzanine investing, venture capital and secondaries.~~

Real Asset Investments: "Real assets" are broadly defined as long-lived, capital intensive, physical or "hard" assets that provide essential products and services to the global economy and/or generally serve as the inputs to economic production.

Real Estate Investments: Investments in land, buildings or other real property.

Real Estate Investment Trusts ("REITs"): A real estate portfolio managed by an investment company for

the benefit of the trust unit holders. The units of most REITs are ~~publicly-traded~~publicly traded.

Regular Account: That portion of OPERF that excludes the Variable Account (defined below). A diversified investment portfolio for which the asset allocation and general investment policies are established and approved by the OIC. ~~Tier One participants are guaranteed a minimum rate of return based on the long-term interest rate used by the actuary. Tier Two participants have no guaranteed rate of return and receive benefits that reflect the Regular Account's actual or realized investment return.~~

Return: The gain or loss in value of an investment over a given period of time expressed as a percentage of the original amount invested. For example, an initial investment of \$100 that grows to \$105 over one year has produced a 5% return.

Risk: The probability of losing money or not achieving the expected investment outcome.

Russell 3000 Index: Measures the investment performance of a composite comprised of stocks issued by the approximately 3,000 largest U.S. companies. Based on total market capitalization, this index represents approximately 98% of the investable U.S. equity market.

~~*S&P Risk Parity Index—12% Target Volatility:* An index designed to proxy the performance of a generic risk parity strategy using public equity, fixed income, and commodity exchange traded futures, levered to target a 12% return volatility. Because there is no widely accepted approach to risk parity, this index is not representative of the "market" but can still serve as a benchmark.~~

Secondaries: The purchase and sale of existing limited partnership commitments to other limited partners and/or fund sponsors.

Sector: A particular group of stocks or bonds that usually characterize a given industry or economic activity. For example, "pharmaceuticals" is the name given to stocks issued by companies researching, manufacturing and selling over-the-counter and prescription medicines. "Corporates" is the name given to fixed income instruments issued by private and public companies.

Sector Funds: A pooled investment product that focuses on a particular industry or economic activity. For example, pooled funds that invest principally in technology stocks would be termed a technology sector fund.

Tracking Error: The amount by which an investor's investment performance differed from a corresponding or assigned benchmark. Usually measured and expressed as the standard deviation of returns relative to a pre-specified benchmark.

Unhedged: A term indicating that the value of one, more or an entire portfolio of assets may be affected by foreign currency fluctuations and that no deliberate attempt has been made to protect against such fluctuations.

Value Added: As used in real estate, may include office, retail, industrial and apartment properties, but may target structured investments in alternative property types such as hotels, student housing, senior housing and specialized retail uses. Portfolios or strategies that are positioned as Value Added are expected to produce returns between Core and Opportunistic portfolios/strategies. For example, a Value Added property may exhibit some "institutional" qualities such as good location and high design and construction quality, but may need significant leasing improvements to stabilize and enhance its value. Value Added investments may also include development opportunities with balanced risk/return profiles.

Value Stock: Stocks that appear to be undervalued for reasons other than low potential earnings growth. Value stocks usually have low price-to-earnings ratios, low price-to-book ratios and a high dividend yield.

Variable Account: An account established for a PERS member who participated in the VAP (defined

below).

Variable Annuity Program ("VAP"): a program that allowed active PERS members to allocate a portion of their yearly, employee retirement contributions to a domestic equity portfolio. No such contributions were allowed after December 31, 2003. Active members who participated in the VAP had part of their balance invested in the Regular Account and part invested in the Variable Account. Unless a member explicitly elected to participate in the VAP, all of that member's employee contributions were invested in the Regular Account. This "primary" election allowed members to place 25 percent, 50 percent or 75 percent of their employee contributions in the Variable Account. Variable Account balances increase or decrease depending on the investment performance of the variable fund, and individual participant accounts are credited for any amount (gain or loss) available for distribution. The OIC's asset allocation policy purview only applies to the Regular Account since the OIC cannot control the investment option elections of VAP participants.

Venture Capital: Independently managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, high growth companies. ~~Outside of the United States, the term venture capital is used as a synonym for all types of alternative or private equity.~~

Vintage Year: The calendar year in which an investment fund's first closing occurs. For example, the 1995 vintage year for venture capital includes all venture capital funds that held a first closing in 1995.

POLICY STATEMENTS

Introduction

1. Subject to ORS 293.721 and 293.726, the Council believes, based on the assumptions outlined herein, that the investment policies summarized in this document will provide the highest possible *return* at a level of *risk* that is appropriate for active and retired OPERF members. The Council evaluates risk in terms of both short-term asset price volatility and long-term plan viability.
2. This objective further contemplates a consecutive ten-year forecast horizon, and the Council also understands that estimates of forward-looking OPERF returns are a primary consideration during PERB's biennial determination of its ADR.
3. Historically, PERS members were allowed to direct up to 75% of their annual, employee retirement contributions to the *Variable Account*. While no longer receiving new contributions, the Variable Account's objective remains investment performance consistent with the *MSCI All Country World Investable Market Index*.
4. The Council has established investment objectives for individual asset classes that are also summarized in this Statement.

Policy Asset Mix, Diversification, and Return Expectations

1. The OIC undertakes a rigorous study of OPERF's assets and liabilities every three to five years (or more frequently, if desired). These asset-liability studies include the following elements for OIC consideration: 1) capital market assumptions by asset class, which include expected returns, volatilities and correlations; 2) proposed asset mixes using various portfolio modeling/construction techniques; 3) OPERF's *liability* structure, *funded status* and liquidity needs; and 4) recommended strategic asset allocation targets and a rebalancing framework. The Council's approved asset mix policy for the Regular Account is summarized in Exhibit 1.
2. Of total Fund assets, ~~50-47.5~~ percent of OPERF is targeted for investment in *equities*, inclusive of *private equity*. Equity investments have generated the highest returns over long time periods, but can also produce low and even negative returns over shorter time periods. The risk of low returns over shorter time periods makes 100% equity policies unsuitable for most pension funds, including OPERF. By investing across multiple equity asset classes, and in lower return but less risky asset classes, the Council manages and diversifies ~~the Fund~~ OPERF's overall risk.
3. Specific asset class exposures are maintained within the ranges outlined in Exhibit 1.

Exhibit 1: Policy Mix for the OPERF Regular Account

Asset Class	Target Allocation (%)	Re-balancing Range (%)
Public Equity	30 25.0	25 20.0 - 35 30.0
Private Equity	20 02.5	15 17.0-5 - 27.5
Total Equity	50 47.05	45 02.5 - 55 52.05
Fixed Income	20 25.0	15 20.0 - 25 30.0
Risk Parity	2.5	0.0 - 3.5
Real Estate	12.5	7.5 - 17.5
Real Assets	7.5	2.5 - 10.0
Diversifying Strategies	7.5	2.5 - 10.0
Total Fund	100.0	

4. The OIC has allocated up to 5.0% of total Fund assets for investment in an *Opportunity Portfolio*, the objective of which is to enhance OPERF returns and/or diversification. Investments in the Opportunity Portfolio are expected to comprise a combination of both shorter-term (1-3 year) and longer-term holdings. The Opportunity Portfolio has no strategic target since, by definition, eligible investments are only pursued on an opportunistic or episodic basis; moreover, the Opportunity Portfolio allocation shall not result in an allocation range breach for any of the other five, primary asset class allocations.
5. OPERF cash balances are invested in the *Oregon Short Term Fund* and managed to levels that are deliberately minimized but still sufficient to cover OPERF's short-term cash flow needs.
6. In an effort to minimize cash balances at both ~~the Fund~~OPERF and manager level, the OIC has retained an overlay manager to more closely align the actual ~~Fund~~portfolio with the approved policy mix, generally through the purchase and sale of futures contracts to increase or decrease specific asset class exposures, as necessary.
7. The Council shall review, at least biennially, its expectations for asset class and active management performance, and assess how the updated expectations affect the probability that the Regular Account will achieve its investment objective.

Rebalancing

1. In the absence of any other considerations, ~~the optimal a reasonable~~ rebalancing strategy would ~~suggest be to~~ continually ~~rebalancing-rebalance~~ back to OPERF's strategic asset allocation targets. Rebalancing ensures that the return objectives and risk tolerance parameters approved by the OIC are consistently and effectively reflected in ~~the Fund~~OPERF. However, rebalancing involves transactions costs such as brokerage fees and market impact. As a result of these costs, ranges are established around the strategic asset allocation targets ~~in order to~~ balance the desirability of

achieving precise target allocations with the various and often material transactions costs associated with these same rebalancing activities. In addition, the overlay manager is expected to minimize cash exposures at both ~~the Fund~~OPERF and individual manager level.

2. With OIC oversight, OST staff develops and implements the rebalancing framework, although the illiquid nature of many private market assets may exempt those assets from staff's short-term rebalancing activities. Rebalancing should be implemented by the most cost-effective means available. For example, cash flows into and out of OPERF will first be used to rebalance back toward asset class targets, whenever possible.
3. A breach of any of the established asset allocation ranges triggers a review and possible rebalancing back to established targets with due consideration given to the liquidity of the affected investments, all anticipated transaction costs and the current portfolio structure within each asset class.

Passive and Active Management

1. Passive management uses lower cost *index funds* to access the return streams available from the world's capital markets. Active management tries to earn higher returns than those available from index funds through the application of manager skill in the form of sector and security selection as well as market and/or asset mix timing decisions.
2. The Council uses passive management to control costs, evaluate active management strategies, capture exposure to *efficient market* segments, manage *tracking error* and facilitate policy mix rebalancing activities.
3. The Council approves active management of Fund assets when proposed active strategies offer sufficiently high expected incremental returns, net of fees, and when the magnitude of potential under-performance can be estimated, monitored and managed.
4. Public equity and fixed income asset classes are managed using both passive and active management strategies. Active management of ~~the Fund~~OPERF's public market equity and fixed income allocations is expected to earn annual return premiums of 0.50% and 0.15%, respectively, over rolling, consecutive five-year periods (and relative to those allocations's respective benchmarks). The Council recognizes that unsuccessful active management can reduce total Fund returns.
5. The Council must accept active management in those asset classes for which there are no passive management alternatives; in particular, private real estate, private equity and other alternative and opportunistic investment strategies.

Public Equity Strategy

1. OPERF's public equity allocation is managed with the objective of earning at least **50 basis points** in annualized net excess return relative to the MSCI All Country World Investable Market Index (~~ACWIIMI—net dividend~~) (unhedged) over rolling, consecutive five-year periods. **Relative to that same benchmark, active risk shall be managed to a 0.75 to 2.0 percent annualized tracking error target.**
2. Key elements of the strategy include the following:
 - a. ~~In an effort to enhance return, strategy will include maintaining an over-weight to small capitalization stocks and other well supported sources of return premia. These strategic overweights or "tilts" are based on and supported by robust empirical research that historically links persistent and pervasive evidence of excess returns to systematic "factor exposures" such as size (i.e., small cap), value and momentum. Implementation of other factor tilts may be considered at the manager, strategy or mandate level upon approval of both the Chief Investment Officer (CIO) and OIC.~~
 - b. Multiple, specialist active managers with complementary investment styles are employed. For example, some OPERF managers focus on growth stocks, some on value stocks, some on large capitalization stocks and others on small capitalization stocks. This diversified approach produces more excess return opportunities and minimizes ~~the Fund~~OPERF's exposure to any single investment organization.
 - c. Aggregate exposures to countries, economic sectors, investment styles and market

capitalization tiers are monitored and managed relative to corresponding benchmark exposures.

Fixed Income Strategy

1. OPERF's fixed income allocation is managed with the objective of earning **15 basis points** in annualized, net excess returns relative to the *Bloomberg Barclays-U.S. Aggregate Index* over rolling, consecutive five-year periods. **Relative to that same benchmark, active risk within the OPERF fixed income allocation is managed to up to 1.0 percent annualized tracking error target.**
2. Key elements of the strategy include the following:
 - a. A significant proportion of the OPERF fixed income allocation is actively managed due to performance and cost considerations. Specifically, excess returns from active fixed income management are likely as many investors hold fixed income securities to meet regulatory and liability matching objectives, and hence are not total return oriented. This market dynamic produces systematic opportunities in fixed income securities that skilled investment managers can exploit. Active fixed income management fees are also much lower than active equity management fees.
 - b. Aggregate exposures to duration, credit and sectors are monitored and managed relative to corresponding exposures in the fixed income allocation benchmark.

Risk Parity Strategy

- ~~1. OPERF's risk parity allocation will be managed with the objective of earning a net total return comparable to an equal risk weighting of traditional asset class indices such as *Bloomberg Barclays U.S. Treasury Index* and the *MSCI ACWI IMI*, using the *S&P Risk Parity Index - 12% Target Volatility* as the policy benchmark over rolling, consecutive five-year periods.~~
- ~~2. Key elements of the strategy include the following:
 - a. Risk Parity is 100% actively managed because there is no widely accepted definition of a passive implementation of risk parity.
 - b. Risk parity strategies provide long only levered exposures to major publicly traded asset classes, such as public equity, fixed income (sometimes separating credit from interest rate), and commodities. Since risk parity strategies typically balance asset class exposures by risk versus nominal exposures, they are levered to target some return objective comparable to a generic balanced exposures. Because each asset class in a risk parity portfolio delivers approximately the same level of risk, as opposed to equity providing the vast majority of the risk in a generic balanced portfolio, the expectation is a risk parity portfolio would deliver a higher risk-adjusted return over a full market cycle.~~

Real Estate Strategy

1. OPERF's real estate allocation is managed with the objective of earning at least **50 basis points** in annualized, net excess returns relative to the *NCREIF Fund Index - Open End Diversified Core Equity (NFI-ODCE)*, net of management fees, over rolling, consecutive five-year periods.
2. Key elements of the strategy include the following:
 - a. Real Estate is 100% actively managed because a passive replication of the full breadth and depth of the real estate asset class is not viable.
 - b. Core property investments represent 55% of ~~the Fund~~OPERF's real estate allocation, with a range of 45% to 65%. Risk is diversified by investing across the following major property types: office; apartments; retail; and industrial. The OPERF real estate allocation may also include structured investments in alternative property types with Core-like risk and return attributes.
 - c. Exchange-traded real estate investment trusts (REITs) represent 5% of ~~the Fund~~OPERF's real estate allocation, with a range of 0% to 10%. Up to 50% of the REIT exposure may be invested in markets outside the United States.
 - d. Value Added property investments represent 20% of the OPERF real estate allocation, with a range of 10% to 30%, and may include direct investments in each of the property types

listed above, as well as structured investments in alternative property types. Risk is diversified by property type and geography.

- e. *Opportunistic* property investments represent 20% of the OPERF real estate allocation, with a range of 10% to 30%. Relative to Core and Value Added strategies, real estate investments will be characterized as "opportunistic" based on higher risk/return expectations and other prevailing market conditions.
- f. Within its real estate allocation, ~~the Fund~~OPERF may participate in *co-investment* opportunities.

Private Equity Strategy

1. OPERF's private equity allocation is managed with the objective of earning at least **300 basis points** in annualized, net excess returns relative to the Russell 3000 Index over ~~very long time horizons, typically~~ rolling, consecutive 10-year periods.
2. Key elements of the strategy include the following:
 - a. Private Equity is 100% actively managed because private equity index funds are not available.
 - b. Risk within OPERF's private equity allocation is diversified by investing across different fund types and strategies including *venture capital, leverage buyout, mezzanine debt, distressed debt, sector funds, secondaries* and *fund-of-funds*.
 - c. OPERF's private equity allocation is further diversified by investing across *vintage year*, industry sectors, investment size, development stage and geography.
 - d. OPERF's private equity investments are managed by external managers operating as general partners. Considerations for private equity manager selection include access to transactions (i.e., "deal flow"), specialized areas of operating expertise, established or promising net of fees performance track records, unique or differentiated investment methodologies and transparent/verifiable reporting processes.
 - e. Within its private equity allocation, ~~the Fund~~OPERF may participate in co-investment opportunities.

Real Assets Strategy

1. OPERF's real assets allocation ~~to Real Assets~~ is managed with the objective of earning at least **400 basis points** in annualized, net excess returns relative to *CPI* over rolling, consecutive ten-year periods.
2. Key elements of the strategy include the following:
 - a. Real assets are 100% actively managed because a passive replication of the full breadth and depth of the real asset investable universe is not viable.
 - b. The ~~Real-real Assets-assets~~ allocation is inclusive of infrastructure and natural resources investments. Specific infrastructure sector exposures will likely include energy, transportation, digital, utilities, and social investments. Specific natural resources sector exposures will likely include oil and gas, agriculture, timberland, metals and mining, and commodities.
 - c. OPERF's real assets allocation is further diversified by investment across *vintage year*, investment size, development stage, and geography.
 - d. Within its real assets allocation, ~~the Fund~~OPERF may also participate in co-investment opportunities.

Diversifying Strategies Strategy

1. OPERF's diversifying strategies allocation ~~to Diversifying Strategies~~ is managed with the objective of outperforming the *HFRI FOF Conservative Index* over rolling, consecutive ~~ten~~**five**-year periods.
2. Key elements of the strategy include the following:
 - a. Diversifying Strategies are 100% actively managed because a passive replication of the full breadth and depth of the diversifying strategy asset class is not viable.
 - b. Diversifying Strategies investments may include long/short, relative value, event driven,

directional, and other special situations strategies. The objective of this sleeve is to invest in strategies with returns uncorrelated with those of the broader Fund. Risk is diversified by investing in multiple managers and across several strategies.

- c. Within its diversifying strategies allocation, ~~the Fund~~OPERF may also participate in co-investment opportunities.

Performance Monitoring and Evaluation

1. The Council and OST staff use a variety of verification and performance measurement tools to monitor, measure and evaluate the management of OPERF assets. Monitoring, reporting and evaluation frequencies range from daily to annually, although quarterly is the most commonly used reporting frequency.
2. The Council directs staff to develop a performance monitoring and evaluation system that validates whether the assets are prudently managed. More specifically, whether Fund investment performance improved benefit security, and capital market risk in general and active management in particular have been sufficiently rewarded.
3. One of many reports used by the Council to satisfy the above requirements is a simple comparison of Regular Account investment performance relative to the Council's assigned total Fund benchmark over rolling, consecutive multi-year periods. Other reports help the Council assess whether or not ~~the Fund~~OPERF was rewarded for its allocations to higher return, higher risk equity investments and whether or not the active management strategies utilized added or subtracted from policy returns on a net of fees basis.
4. The reporting described in this section gives the Council a consolidated or "big picture" view of Regular Account investment performance. Regular Account investment performance across primary asset allocation categories will also be reported to the OIC. Upon request and if available, staff will also provide the Council more granular performance reporting, e.g., at the individual manager level.
5. The OST Compliance program will a) monitor and evaluate portfolios and asset classes and determine compliance with OST policies and contractual obligations; b) identify instances of non-compliance and develop and execute appropriate resolution strategies; c) provide relevant compliance information and reports to OST management and ~~the Fund~~OPERF, as appropriate; and d) when applicable, verify resolution by the appropriate individual or manager within the appropriate time frame.

Exceptions

None.

Failure to Comply

Failure to comply with this policy may be cause for disciplinary action up to and including dismissal.

PROCEDURES and FORMS

None.

ADMINISTRATION

Review

Annually.

Feedback

Your comments are extremely important to improving the effectiveness of this policy. If you would like

to comment on the provisions of this policy, you may do so by e-mailing the Policy Analyst. To ensure your comments are received without delay, *please list the policy number and name in your e-mail's subject*. Your comments will be reviewed during the policy revisions process and may result in changes to the policy.

INV 1203

INTRODUCTION & OVERVIEW

Summary Policy Statement

This Statement of Investment Objectives and Policy Framework (the "Statement") summarizes the philosophy, objectives and policies approved by the *Oregon Investment Council* (the "OIC" or the "Council") for the investment of *Oregon Public Employees Retirement Fund* (OPERF) assets.

1. The Statement has been prepared with six audiences in mind: 1) incumbent, new and prospective Council members; 2) *Oregon State Treasury* ("OST") staff; 3) the Public Employees Retirement Board ("PERB"); 4) active and retired Oregon Public Employees Retirement System (PERS) members; 5) the Oregon State Legislature and Governor; and 6) agents engaged by the Council to manage and administer Fund assets.
2. The Council approved these objectives and framework after careful consideration of PERS benefit provisions, and the implications of alternative objectives and policies.
3. The Statement summarizes more detailed policy and procedure documents prepared and maintained by staff, and numerous other documents that govern the day-to-day management of OPERF assets including agent agreements, individual investment manager mandates and limited partnership documents.
4. The Council regularly assesses the continued suitability of its approved investment objectives and policies, initiates change as necessary and updates these documents accordingly.

Applicability

Classified represented, management service, unclassified executive service.

Authority

ORS Chapter 293.

POLICY PROVISIONS

Definitions

Actuarial Discount Rate ("ADR"): The discount rate set by the PERB to calculate the present value of a defined benefit plan's future obligations and determine the size of the plan sponsor's annual contribution.

Asset Class: A collection of securities that have conceptually similar claims on income streams and have returns that are highly correlated with each other. The most frequently referenced asset classes include equities, fixed income, real estate and cash.

Basis Point: This refers to a common unit of financial measurement. One basis point equals 0.01%. One hundred basis points equal 1% or one percentage point.

Benchmark: A standard by which investment performance can be measured and evaluated. For example, the performance of U.S. equity managers is often measured and evaluated relative to the Russell 3000 Index. In this case, the Russell 3000 Index serves as or represents the U.S. equity benchmark.

Benchmark Exposure: The proportion that a given stock represents within a benchmark, such as the Russell 3000 Index of U.S. equity securities. Allows investors to measure the extent to which a portfolio or specific investment strategy is over- or under-exposed to a particular stock or investment characteristic (e.g., market capitalization) relative to a benchmark.

Bloomberg U.S. Aggregate Index: This index covers the U.S. investment-grade fixed rate bond market.

and includes government, corporate, mortgage pass-through and asset-backed securities. These major sectors are subdivided into more specific indices that are calculated and reported on a regular basis. Its constituents are SEC-registered, taxable, dollar-denominated securities that conform to specific parameters.

Co-investment: Although used loosely to describe any two parties that invest alongside one another in the same company, this term has a special meaning in the context of an investment fund's limited partners. By having co-investment rights, a limited partner can invest directly in a company that is simultaneously backed by the fund's general partner. In this way, the limited partner has two separate stakes in the company: the first, an indirect investment through its participation in the general partner's fund; the second, a direct investment alongside the general partner. While the direct, co-investment opportunity is usually offered at terms and conditions more favorable than the fund investment, the direct, concentrated nature of the co-investment opportunity implies higher risk for the limited partner.

Core: Real estate investment strategies which exhibit "institutional" qualities, such as superior location, high occupancy and premium design and construction quality.

Credit: Used most often in a fixed income context, the measure of an organization's ability to re-pay borrowed money. Organizations with the highest credit rating (i.e., those most likely to re-pay borrowed money) are assigned a AAA credit rating.

Distressed Debt: A private equity investment strategy that involves purchasing discounted bonds of a financially distressed firm. Distressed debt investors frequently convert their holdings into equity and become actively involved in the management of the distressed firm.

Diversification: Reducing risk without a commensurate reduction in expected return by combining assets and/or investment strategies with low or uncorrelated return and volatility profiles. For example, a decline in the price of one asset (e.g., oil stocks) is offset by an increase in the price of another asset (e.g., airline stocks). In lay terms, this principle is often described as "putting your eggs in more than one basket".

Diversifying Strategies: Investment strategies that attempt to generate returns that are independent of asset class returns and may include systematically capturing certain risk premia beyond traditional equity and fixed income market exposures.

Duration: A financial measure used by investors to estimate the price sensitivity of a fixed income security relative to changes in interest rates. For example, if interest rates increase by 1 percentage point, a bond with a duration of 5 years will decline in price by approximately 5 percent.

Efficient Market: A market in which security prices rapidly reflect all information germane to the price discovery process. A primary implication of an efficient market is that active management efforts often fail to produce results that consistently beat the performance of an index fund or other passive strategy net of fees, transactions costs and other expenses.

Equities: Investments that represent ownership in a company and therefore a proportional share of company profits.

Fixed Income: Debt obligations that specify the precise repayment of previously borrowed money. Typically, repayment takes the form of a series of fixed-amount, semi-annual interest payments and a single, final repayment of principal.

Funded Status: A comparison of a pension plan's assets and liabilities where the latter are often referred to as the plan's projected benefit obligation ("PBO"). When a plan's assets exceed its PBO, the plan is considered overfunded. Conversely, if a plan's assets are less than its PBO, the plan is considered underfunded and the plan sponsor has a net liability position with respect to its pension plan.

Fund-of-funds (FOFs): Often organized by an investment advisor or investment bank, a fund that invests

in other funds rather than directly in securities, operating firms or other assets.

Growth Stock: Stocks exhibiting faster-than-average earnings growth with expectations that such growth will continue. Growth stocks usually have high price-to-earnings ratios, high price-to-book ratios and low to no dividend yields.

Hedge Fund Research Inc. Fund of Funds Conservative Index (HFRI FOF Conservative Index): The HFRI FOF Conservative Index is an investment performance composite published monthly by Hedge Fund Research, Inc. (HFRI). This index is a capitalization-weighted index of FOFs pursuing a "conservative" investment strategy and conforming to specific parameters. A fund in the HFRI FOF Conservative Index shows generally consistent performance regardless of market conditions.

Hedged: A term applied to one, more or an entire portfolio of assets indicating that the base country value of such assets is partially or wholly protected from foreign currency fluctuations. Forward currency contracts are typically used to hedge or offset the effects of these fluctuations.

Index Fund: A portfolio management strategy that seeks to match the composition and performance of a select index such as the Russell 3000 or S&P 500.

Leverage Buyout (LBO): A strategy in which debt financing is used to acquire a firm or business unit, typically in a mature industry. LBO debt is usually repaid according to a strict schedule that absorbs most of the acquired firm's cash flow.

Liability: A claim on assets by individuals or companies. In a pension context, liabilities represent the claim on fund assets by active and retired plan beneficiaries.

MSCI All Country World Investable Market Index (ACWI IMI): A capitalization-weighted index that includes approximately 9,000 publicly traded equity securities and is designed to measure equity market performance across developed and emerging markets. This index consists of over 40 separate developed and emerging market country indices.

Market Capitalization: The value of a corporation as determined by multiplying the price of its shares by the number of shares outstanding. In general, the share prices of smaller capitalized companies are more volatile than those of larger capitalized companies.

Mezzanine: Either a private equity financing undertaken shortly before an initial public offering, or an investment strategy that employs subordinated debt (which has fewer privileges than bank debt but more standing than equity) and often is issued with attached equity warrants.

NCREIF Fund Index – Open End Diversified Core Equity (NFI-ODCE): The NFI-ODCE is an investment performance composite published quarterly by the National Council of Real Estate Investment Fiduciaries (NCREIF). This index is a capitalization-weighted index of approximately 30 open-ended, commingled funds pursuing a "core" investment strategy and conform to specific parameters.

Oregon State Treasury: Headed by the State Treasurer, the Oregon State Treasury is responsible for managing the day-to-day investment operations of the state pension fund (and other funds), issuing all state debt, and serving as the central bank for state agencies. Within the Oregon State Treasury, the Investment Division also manages investment programs for the state's deferred compensation and college savings plans, and serves as staff to the Oregon Investment Council.

Opportunistic: Higher risk but higher expected return real estate investments that are usually illiquid, produce little or no current income and are often focused on distressed and/or highly leveraged properties.

Opportunity Portfolio: Includes non-traditional and/or concentrated investment strategies that may provide enhanced diversification and/or unique sources of return relative to the other asset classes included in the OIC's approved policy mix. The Opportunity Portfolio's objectives are pursued by

investing in strategies that fall outside the boundaries of "strategic" or approved policy mix allocations including new or innovative strategies across a wide range of potential investment opportunities and with few limitations or constraints.

Oregon Investment Council: Oregon Revised Statutes ("ORS") 293.706 establishes the OIC, which consists of five voting members, four of whom are appointed by the Governor and subject to Senate confirmation (the Treasurer serves as an ex-officio member, and is therefore not subject to confirmation). The members appointed by the Governor must be qualified by training and experience in the field of investment or finance. In addition, the Director of the Oregon Public Employees Retirement System is a non-voting ex-officio member of the OIC. ORS 293.721 and 293.726 establish the OIC's investment objectives and standards of judgment and care.

Oregon Public Employees Retirement Fund: Holds the assets of beneficiaries of PERS, which is a state-wide, defined benefit retirement plan for units of state government, political subdivisions, community colleges and school districts. PERS is administered under ORS chapters 237, 238, 238A, and applicable provisions of the Internal Revenue Code by the PERB. Participation by state government units, school districts, and community colleges is mandatory. Participation by most political subdivisions is optional, but irrevocable if elected. All system assets accumulated for the payment of benefits may legally be used to pay benefits to any of the plan members or beneficiaries of the system. PERS is responsible for administering the management of the plan's liability and participant benefits.

Oregon Short Term Fund (OSTF): The state's commingled cash investment pool managed internally by Treasury staff. The OSTF includes all excess state agency cash, as required by law, as well as cash invested by local governments on a discretionary basis. The OSTF is invested in accordance with investment guidelines recommended by the state's Oregon Short Term Fund Board and approved by the OIC.

Overlay Manager: An investment advisor retained by the OIC to monitor daily cash balances in OPERF and execute trades in the equity and fixed income futures markets to adjust OPERF's overall asset allocation closer to its OIC-approved targets.

Overweight: A stock, sector or capitalization exposure that is higher than the corresponding exposure in a given asset class benchmark, such as the Russell 3000 Index.

Private Equity: A broad category of investments in private companies that includes leverage buyouts, mezzanine investing, venture capital and secondaries.

Real Asset Investments: Real assets are broadly defined as long-lived, capital intensive, physical or "hard" assets that provide essential products and services to the global economy and/or generally serve as the inputs to economic production.

Real Estate Investments: Investments in land, buildings or other real property.

Real Estate Investment Trusts (REITs): A real estate portfolio managed by an investment company for the benefit of the trust unit holders. The units of most REITs are publicly traded.

Regular Account: That portion of OPERF that excludes the Variable Account (defined below). A diversified investment portfolio for which the asset allocation and general investment policies are established and approved by the OIC.

Return: The gain or loss in value of an investment over a given period of time expressed as a percentage of the original amount invested. For example, an initial investment of \$100 that grows to \$105 over one year has produced a 5% return.

Risk: The probability of losing money or not achieving the expected investment outcome.

Russell 3000 Index: Measures the investment performance of a composite comprised of stocks issued by the approximately 3,000 largest U.S. companies. Based on total market capitalization, this index represents approximately 98% of the investable U.S. equity market.

Secondaries: The purchase and sale of existing limited partnership commitments to other limited partners and/or fund sponsors.

Sector: A particular group of stocks or bonds that usually characterize a given industry or economic activity. For example, "pharmaceuticals" is the name given to stocks issued by companies researching, manufacturing and selling over-the-counter and prescription medicines. "Corporates" is the name given to fixed income instruments issued by private and public companies.

Sector Funds: A pooled investment product that focuses on a particular industry or economic activity. For example, pooled funds that invest principally in technology stocks would be termed a technology sector fund.

Tracking Error: The amount by which an investor's investment performance differed from a corresponding or assigned benchmark. Usually measured and expressed as the standard deviation of returns relative to a pre-specified benchmark.

Unhedged: A term indicating that the value of one, more or an entire portfolio of assets may be affected by foreign currency fluctuations and that no deliberate attempt has been made to protect against such fluctuations.

Value Added: As used in real estate, may include office, retail, industrial and apartment properties, but may target structured investments in alternative property types such as hotels, student housing, senior housing and specialized retail uses. Portfolios or strategies that are positioned as Value Added are expected to produce returns between Core and Opportunistic portfolios/strategies. For example, a Value Added property may exhibit some "institutional" qualities such as good location and high design and construction quality, but may need significant leasing improvements to stabilize and enhance its value. Value Added investments may also include development opportunities with balanced risk/return profiles.

Value Stock: Stocks that appear to be undervalued for reasons other than low potential earnings growth. Value stocks usually have low price-to-earnings ratios, low price-to-book ratios and a high dividend yield.

Variable Account: An account established for a PERS member who participated in the VAP (defined below).

Variable Annuity Program (VAP): a program that allowed active PERS members to allocate a portion of their yearly, employee retirement contributions to a domestic equity portfolio. No such contributions were allowed after December 31, 2003. Active members who participated in the VAP had part of their balance invested in the Regular Account and part invested in the Variable Account. Unless a member explicitly elected to participate in the VAP, all of that member's employee contributions were invested in the Regular Account. This "primary" election allowed members to place 25 percent, 50 percent or 75 percent of their employee contributions in the Variable Account. Variable Account balances increase or decrease depending on the investment performance of the variable fund, and individual participant accounts are credited for any amount (gain or loss) available for distribution. The OIC's asset allocation policy purview only applies to the Regular Account since the OIC cannot control the investment option elections of VAP participants.

Venture Capital: Independently managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, high growth companies.

Vintage Year: The calendar year in which an investment fund's first closing occurs. For example, the 1995 vintage year for venture capital includes all venture capital funds that held a first closing in 1995.

POLICY STATEMENTS

Introduction

1. Subject to ORS 293.721 and 293.726, the Council believes, based on the assumptions outlined herein, that the investment policies summarized in this document will provide the highest possible *return* at a level of *risk* that is appropriate for active and retired OPERF members. The Council evaluates risk in terms of both short-term asset price volatility and long-term plan viability.
2. This objective further contemplates a consecutive ten-year forecast horizon, and the Council also understands that estimates of forward-looking OPERF returns are a primary consideration during PERB's biennial determination of its ADR.
3. Historically, PERS members were allowed to direct up to 75% of their annual, employee retirement contributions to the *Variable Account*. While no longer receiving new contributions, the Variable Account's objective remains investment performance consistent with the *MSCI All Country World Investable Market Index*.
4. The Council has established investment objectives for individual asset classes that are also summarized in this Statement.

Policy Asset Mix, Diversification, and Return Expectations

1. The OIC undertakes a rigorous study of OPERF's assets and liabilities every three to five years (or more frequently, if desired). These asset-liability studies include the following elements for OIC consideration: 1) capital market assumptions by asset class, which include expected returns, volatilities and correlations; 2) proposed asset mixes using various portfolio modeling/construction techniques; 3) OPERF's *liability* structure, *funded status* and liquidity needs; and 4) recommended strategic asset allocation targets and a rebalancing framework. The Council's approved asset mix policy for the Regular Account is summarized in Exhibit 1.
2. Of total Fund assets, 47.5 percent of OPERF is targeted for investment in *equities*, inclusive of *private equity*. Equity investments have generated the highest returns over long time periods, but can also produce low and even negative returns over shorter time periods. The risk of low returns over shorter time periods makes 100% equity policies unsuitable for most pension funds, including OPERF. By investing across multiple equity asset classes, and in lower return but less risky asset classes, the Council manages and diversifies OPERF's overall risk.
3. Specific asset class exposures are maintained within the ranges outlined in Exhibit 1.

Exhibit 1: Policy Mix for the OPERF Regular Account

Asset Class	Target Allocation (%)	Re-balancing Range (%)
Public Equity	25.0	20.0 - 30.0
Private Equity	22.5	17.5 - 27.5
Total Equity	47.5	42.5 - 52.5
Fixed Income	25.0	20.0 - 30.0
Real Estate	12.5	7.5 - 17.5

Asset Class	Target Allocation (%)	Re-balancing Range (%)
Real Assets	7.5	2.5 - 10.0
Diversifying Strategies	7.5	2.5 - 10.0

Total Fund 100.0

- The OIC has allocated up to 5.0% of total Fund assets for investment in an *Opportunity Portfolio*, the objective of which is to enhance OPERF returns and/or diversification. Investments in the Opportunity Portfolio are expected to comprise a combination of both shorter-term (1-3 year) and longer-term holdings. The Opportunity Portfolio has no strategic target since, by definition, eligible investments are only pursued on an opportunistic or episodic basis; moreover, the Opportunity Portfolio allocation shall not result in an allocation range breach for any of the other five, primary asset class allocations.
- OPERF cash balances are invested in the *Oregon Short Term Fund* and managed to levels that are deliberately minimized but still sufficient to cover OPERF's short-term cash flow needs.
- In an effort to minimize cash balances at both OPERF and manager level, the OIC has retained an overlay manager to more closely align the actual portfolio with the approved policy mix, generally through the purchase and sale of futures contracts to increase or decrease specific asset class exposures, as necessary.
- The Council shall review, at least biennially, its expectations for asset class and active management performance, and assess how the updated expectations affect the probability that the Regular Account will achieve its investment objective.

Rebalancing

- In the absence of any other considerations, a reasonable rebalancing strategy would be to continually rebalance back to OPERF's strategic asset allocation targets. Rebalancing ensures that the return objectives and risk tolerance parameters approved by the OIC are consistently and effectively reflected in OPERF. However, rebalancing involves transactions costs such as brokerage fees and market impact. As a result of these costs, ranges are established around the strategic asset allocation targets to balance the desirability of achieving precise target allocations with the various and often material transactions costs associated with these same rebalancing activities. In addition, the overlay manager is expected to minimize cash exposures at both OPERF and individual manager level.
- With OIC oversight, OST staff develops and implements the rebalancing framework, although the illiquid nature of many private market assets may exempt those assets from staff's short-term rebalancing activities. Rebalancing should be implemented by the most cost-effective means available. For example, cash flows into and out of OPERF will first be used to rebalance back toward asset class targets, whenever possible.
- A breach of any of the established asset allocation ranges triggers a review and possible rebalancing back to established targets with due consideration given to the liquidity of the affected investments, all anticipated transaction costs and the current portfolio structure within each asset class.

Passive and Active Management

- Passive management uses lower cost *index funds* to access the return streams available from the world's capital markets. Active management tries to earn higher returns than those available from index funds through the application of manager skill in the form of sector and security selection as well as market and/or asset mix timing decisions.
- The Council uses passive management to control costs, evaluate active management strategies,

capture exposure to *efficient market* segments, manage *tracking error* and facilitate policy mix re-balancing activities.

3. The Council approves active management of Fund assets when proposed active strategies offer sufficiently high expected incremental returns, net of fees, and when the magnitude of potential under-performance can be estimated, monitored and managed.
4. Public equity and fixed income asset classes are managed using both passive and active management strategies. Active management of OPERF's public market equity and fixed income allocations is expected to earn annual return premiums of 0.50% and 0.15%, respectively, over rolling, consecutive five-year periods (and relative to those allocations' respective benchmarks). The Council recognizes that unsuccessful active management can reduce total Fund returns.
5. The Council must accept active management in those asset classes for which there are no passive management alternatives; in particular, private real estate, private equity and other alternative and opportunistic investment strategies.

Public Equity Strategy

1. OPERF's public equity allocation is managed with the objective of earning at least **50 basis points** in annualized net excess return relative to the MSCI All Country World Investable Market Index (net dividend) (unhedged) over rolling, consecutive five-year periods. **Relative to that same benchmark, active risk shall be managed to a 0.75 to 2.0 percent annualized tracking error target.**
2. Key elements of the strategy include the following:
 - a. Multiple, specialist active managers with complementary investment styles are employed. For example, some OPERF managers focus on growth stocks, some on value stocks, some on large capitalization stocks and others on small capitalization stocks. This diversified approach produces more excess return opportunities and minimizes OPERF's exposure to any single investment organization.
 - b. Aggregate exposures to countries, economic sectors, investment styles and market capitalization tiers are monitored and managed relative to corresponding benchmark exposures.

Fixed Income Strategy

1. OPERF's fixed income allocation is managed with the objective of earning **15 basis points** in annualized, net excess returns relative to the *Bloomberg U.S. Aggregate Index* over rolling, consecutive five-year periods. **Relative to that same benchmark, active risk within the OPERF fixed income allocation is managed to up to 1.0 percent annualized tracking error target.**
2. Key elements of the strategy include the following:
 - a. A significant proportion of the OPERF fixed income allocation is actively managed due to performance and cost considerations. Specifically, excess returns from active fixed income management are likely as many investors hold fixed income securities to meet regulatory and liability matching objectives, and hence are not total return oriented. This market dynamic produces systematic opportunities in fixed income securities that skilled investment managers can exploit. Active fixed income management fees are also much lower than active equity management fees.
 - b. Aggregate exposures to duration, credit and sectors are monitored and managed relative to corresponding exposures in the fixed income allocation benchmark.

Real Estate Strategy

1. OPERF's real estate allocation is managed with the objective of earning at least **50 basis points** in annualized, net excess returns relative to the *NCREIF Fund Index – Open End Diversified Core Equity*, net of management fees, over rolling, consecutive five-year periods.
2. Key elements of the strategy include the following:
 - a. Real Estate is 100% actively managed because a passive replication of the full breadth and depth of the real estate asset class is not viable.
 - b. Core property investments represent 55% of OPERF's real estate allocation, with a range

of 45% to 65%. Risk is diversified by investing across the following major property types: office; apartments; retail; and industrial. The OPERF real estate allocation may also include structured investments in alternative property types with Core-like risk and return attributes.

- c. Exchange-traded real estate investment trusts (REITs) represent 5% of OPERF's real estate allocation, with a range of 0% to 10%. Up to 50% of the REIT exposure may be invested in markets outside the United States.
- d. *Value Added* property investments represent 20% of the OPERF real estate allocation, with a range of 10% to 30%, and may include direct investments in each of the property types listed above, as well as structured investments in alternative property types. Risk is diversified by property type and geography.
- e. *Opportunistic* property investments represent 20% of the OPERF real estate allocation, with a range of 10% to 30%. Relative to Core and Value Added strategies, real estate investments will be characterized as "opportunistic" based on higher risk/return expectations and other prevailing market conditions.
- f. Within its real estate allocation, OPERF may participate in *co-investment* opportunities.

Private Equity Strategy

1. OPERF's private equity allocation is managed with the objective of earning at least **300 basis points** in annualized, net excess returns relative to the Russell 3000 Index over rolling, consecutive 10-year periods.
2. Key elements of the strategy include the following:
 - a. Private Equity is 100% actively managed because private equity index funds are not available.
 - b. Risk within OPERF's private equity allocation is diversified by investing across different fund types and strategies including *venture capital, leverage buyout, mezzanine debt, distressed debt, sector funds, secondaries* and *fund-of-funds*.
 - c. OPERF's private equity allocation is further diversified by investing across *vintage year*, industry sectors, investment size, development stage and geography.
 - d. OPERF's private equity investments are managed by external managers operating as general partners. Considerations for private equity manager selection include access to transactions (i.e., "deal flow"), specialized areas of operating expertise, established or promising net of fees performance track records, unique or differentiated investment methodologies and transparent/verifiable reporting processes.
 - e. Within its private equity allocation, OPERF may participate in co-investment opportunities.

Real Assets Strategy

1. OPERF's real assets allocation is managed with the objective of earning at least **400 basis points** in annualized, net excess returns relative to *CPI* over rolling, consecutive ten-year periods.
2. Key elements of the strategy include the following:
 - a. Real assets are 100% actively managed because a passive replication of the full breadth and depth of the real asset investable universe is not viable.
 - b. The real assets allocation is inclusive of infrastructure and natural resources investments. Specific infrastructure sector exposures will likely include energy, transportation, digital, utilities, and social investments. Specific natural resources sector exposures will likely include oil and gas, agriculture, timberland, metals and mining, and commodities.
 - c. OPERF's real assets allocation is further diversified by investment across *vintage year*, investment size, development stage, and geography.
 - d. Within its real assets allocation, OPERF may also participate in co-investment opportunities.

Diversifying Strategies Strategy

1. OPERF's diversifying strategies allocation is managed with the objective of outperforming the
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- Master Page # 107 of 222 - Board of Directors (OIC) Meeting 12/7/2022

HFRI FOF Conservative Index over rolling, consecutive five-year periods.

2. Key elements of the strategy include the following:
 - a. Diversifying Strategies are 100% actively managed because a passive replication of the full breadth and depth of the diversifying strategy asset class is not viable.
 - b. Diversifying Strategies investments may include long/short, relative value, event driven, directional, and other special situations strategies. The objective of this sleeve is to invest in strategies with returns uncorrelated with those of the broader Fund. Risk is diversified by investing in multiple managers and across several strategies.
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3. One of many reports used by the Council to satisfy the above requirements is a simple comparison of Regular Account investment performance relative to the Council's assigned total Fund benchmark over rolling, consecutive multi-year periods. Other reports help the Council assess whether or not OPERF was rewarded for its allocations to higher return, higher risk equity investments and whether or not the active management strategies utilized added or subtracted from policy returns on a net of fees basis.
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Exceptions

None.

Failure to Comply

Failure to comply with this policy may be cause for disciplinary action up to and including dismissal.

PROCEDURES and FORMS

None.

ADMINISTRATION

Review

Annually.

Feedback

Your comments are extremely important to improving the effectiveness of this policy. If you would like to comment on the provisions of this policy, you may do so by e-mailing the Policy Analyst. To ensure your comments are received without delay, *please list the policy number and name in your e-mail's subject*. Your comments will be reviewed during the policy revisions process and may result in changes to the policy.

INV 1203

INTRODUCTION & OVERVIEW

Summary Policy Statement

The strategic role of risk parity investments is delineated in the Oregon Investment Council ("OIC") Statement of Investment Objectives and Policy Framework for the Oregon Public Employees Retirement Fund ("OPERF" or the "Fund"). The OPERF Risk Parity Portfolio (the "Portfolio") is expected to provide return and diversification opportunities, as well as liquidity to help meet OPERF's cash flow requirements. Oregon State Treasury staff ("OST" and "Staff"), with approval from the Chief Investment Officer ("CIO") or the CIO's delegate and notification to the OIC, will have the discretion to rebalance between and among managers within the Portfolio.

Purpose and Goals

The purpose of this policy is to provide guidance to OST staff and advisors regarding the Portfolio and its investment objectives.

Applicability

Classified represented, management service, unclassified executive service.

Authority

ORS Chapter 293.

POLICY PROVISIONS

Definitions

Bloomberg Barclays Global Treasury Bond Index: A capitalization-weighted index that includes local currency government debt of over 30 investment grade countries and is designed to measure fixed income market performance due to local interest rates.

Exchange-Traded Future: A future is a derivative instrument (it *derives* its value from the price of a referenced asset) that trades on an exchange, such as the Chicago Mercantile Exchange or the London International Financial Futures and Options Exchange, between two parties to buy or sell the referenced asset at a specified future time. The asset can be almost any physical or financial instrument, such as soybean meal, the 10-Year U.S. Treasury note, or the Japanese yen/U.S. dollar exchange rate. Futures are cost-effective because little cash is transferred with futures are traded. An initial margin is posted to the exchange (the ultimate counterparty) when the contract is traded and a daily "variation margin", or cash transfer, occurs between the exchange and the investor's account to adjust for subsequent market movements.

Leverage: Borrowing money to gain an investment exposure greater than invested capital. Leverage magnifies investment performance, providing an opportunity for greater return but also one for greater loss. Leverage in the capital markets can be easily obtained using exchange-traded futures.

MSCI World Ex-U.S. Index: A capitalization-weighted index that includes approximately 1,600 publicly-traded equity securities and is designed to measure equity market performance across developed markets. This index consists of over 20 separate developed market country indices.

S&P Risk Parity Index – 12% Target Volatility: An index designed to represent the performance of a generic risk parity strategy using public equity, fixed income, and commodity exchange-traded futures, levered to target a 12% return volatility. Because there is no widely-accepted approach to risk parity, this

index is not representative of the "market" but can still serve as a benchmark.

Policy Statements

A. OBJECTIVES

The Portfolio's investment performance objective is long-term net returns (i.e., after management fees) return commensurate with the *S&P Risk Parity Index – 12% Target Volatility* (the "Benchmark") over a market cycle of three to five years and on a net-of-fee basis. Any changes to the policy benchmark will be approved by the OIC. A secondary benchmark of 60% MSCI World Index and 40% Bloomberg Barclays Global Treasury Bond Index will also be used. This custom benchmark is a widely-accepted proxy for a balanced multi-asset portfolio.

B. STRATEGIES

1. Risk parity strategies provide long-only leveraged exposures to major publicly-traded asset classes, such as public equity, fixed income (sometimes separating credit from interest rate), and commodities. Since risk parity strategies typically balance asset class exposures by risk versus nominal exposures, they use *leverage* to target some return objective comparable to a generic balanced portfolio. Because each asset class in a risk parity portfolio delivers approximately the same level of risk, as opposed to equity providing the vast majority of the risk in a generic balanced portfolio, the expectation is a risk parity portfolio would deliver a higher risk-adjusted return over a full market cycle than a typical balanced multi-asset portfolio.
2. By construction, a risk parity portfolio is already diversified. Adding multiple risk parity managers should reduce return variance without substantially changing the diversification characteristics. However, Staff shall consider the composition of the Portfolio, paying close attention that the component asset classes deliver roughly comparable exposures as those of traditional asset class indices, such as *MSCI World Index* or *Bloomberg Barclays Global Treasury Bond Index*.
3. Actively-managed strategies are expected to outperform the Benchmark on an after-fee and risk-adjusted basis. Comparisons against a representative peer group universe will also be considered in evaluating the performance and risk characteristics of these strategies.

C. OST STAFF AUTHORITY & REPORTING

1. Staff will have discretion, with advance approval of the CIO or the CIO's delegate and subsequent notice to the OIC, to rebalance between and among managers.
2. Re-allocations between asset classes shall adhere to Policy INV 1203: Statement of Investment Objectives and Policy Framework for the Oregon Public Employees Retirement Fund.
3. OST Staff, with approval from the CIO and notification to the OIC, may terminate "at will" any manager according to the terms of its contract with and on behalf of the OIC.

Exceptions

None.

Failure to Comply

Failure to comply with this policy may be cause for disciplinary action up to and including dismissal.

PROCEDURES and FORMS

ADMINISTRATION

Review

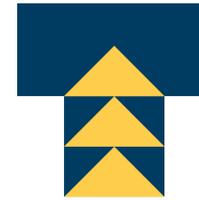
Biennial

Feedback

Your comments are extremely important to improving the effectiveness of this policy. If you would like to comment on the provisions of this policy, you may do so by e-mailing the Policy Analyst. To ensure your comments are received without delay, *please list the policy number and name in your e-mail's subject*. Your comments will be reviewed during the policy revisions process and may result in changes to the policy.

INV 610

O I C



OREGON
STATE
TREASURY

TAB 4
OPERF OPPORTUNITY PORTFOLIO
CONSULTANT APPROVAL

O I C



OREGON
STATE
TREASURY

TAB 5
OPERF PUBLIC EQUITY
ANNUAL REVIEW

December 7, 2022

OPERF Public Equity Portfolio 2022 Annual Review

Louise Howard

Senior Investment Officer, Public Equity

Wil Hiles

Investment Officer, Public Equity

Claire Illo

Investment Officer, Public Equity



**OREGON
STATE
TREASURY**

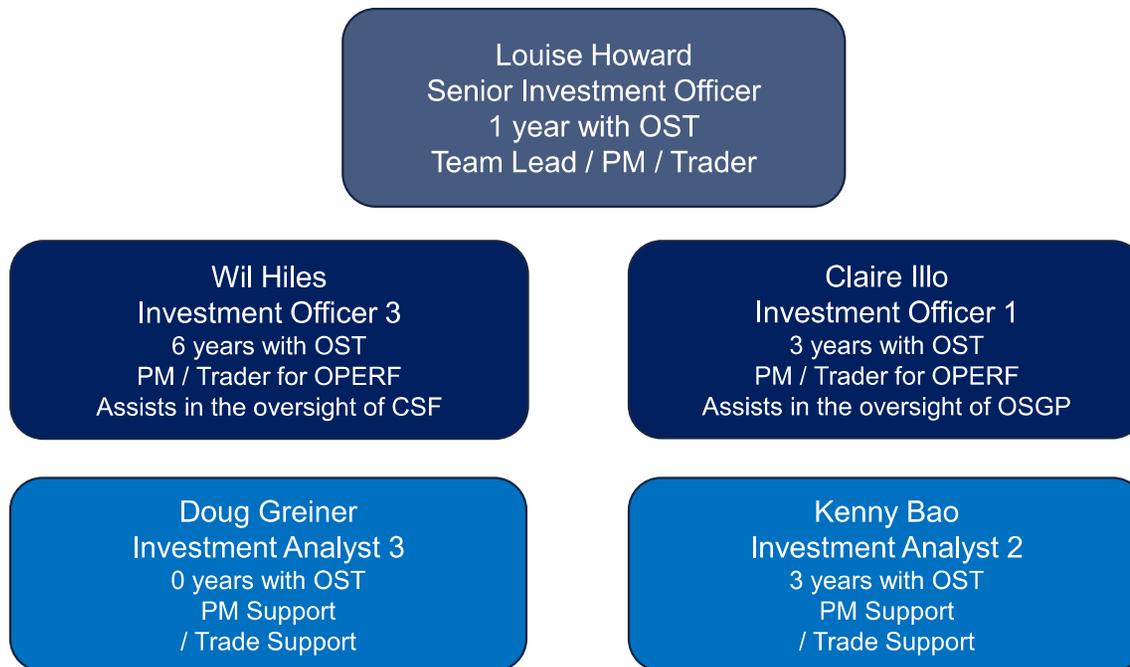
Agenda

Section	Pages	OIC Investment and Management Beliefs Mapping																	
		1A	1B	1C	1D	2A	2B	3A	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A
Agenda	2																		
Public Equity Team	3																		
Strategic Role	4					■		■											
Benchmark/Structure/Internal Mgmt	5-9					■	■					■	■						
Risk Analysis - Factors & Active Risk	10-11					■	■												
Path Forward	12-15																		
Risk Analysis - Factors & Active Risk (PF)	16-17					■	■												
Timeline	18					■	■												
ESG Update	19																	■	■
2023 Goals	20																		

LEGEND: OIC INVESTMENT AND MANAGEMENT BELIEFS	
1	THE OIC SETS POLICY AND IS ULTIMATELY RESPONSIBLE FOR THE INVESTMENT PROGRAM A. Investment management is dichotomous -- part art and part science. B. The OIC is a policy-setting council that largely delegates investment management activities to the OST and qualified external fiduciaries. C. The OIC is vested with the authority to set and monitor portfolio risk. Both short-term and long-term risks are critical. D. To exploit market inefficiencies, the OIC should be long term, contrarian, innovative, and opportunistic in its investment approach.
2	ASSET ALLOCATION DRIVES RISK AND RETURN ■ A. Asset allocation is the OIC's primary policy tool for managing the investment program's long-term risk/return profile. ■ B. Portfolio construction, including diversification and correlation considerations, is essential to maximizing risk-adjusted returns.
3	THE EQUITY RISK PREMIUM WILL BE REWARDED ■ A. Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.
4	PRIVATE MARKET INVESTMENTS CAN ADD SIGNIFICANT VALUE AND REPRESENT A CORE OIC/OST COMPETENCY A. The OIC can capitalize on its status as a true, long-term investor by making meaningful allocations to illiquid, private market investments. B. Dispersion in private market investment returns is wide; accordingly, top-quartile manager selection, diversification across vintage year, strategy type, and geography, and careful attention to costs are paramount.
5	CAPITAL MARKETS HAVE INEFFICIENCIES THAT CAN BE EXPLOITED ■ A. Inefficiencies that can be exploited by active management may exist in certain segments of the capital markets. ■ B. Passive investment management in public markets will outperform the median active manager in those markets over time.
6	COSTS DIRECTLY IMPACT INVESTMENT RETURNS AND SHOULD BE MONITORED AND MANAGED CAREFULLY ■ A. All fees, expenses, commissions, and transaction costs should be diligently monitored and managed in order to maximize net investment returns. ■ B. External incentive structures should be carefully evaluated to ensure proper alignment with investment program objectives.
7	FAIR AND EFFICIENT CAPITAL MARKETS ARE ESSENTIAL FOR THE LONG-TERM INVESTMENT SUCCESS A. The OIC recognizes that the quality of regulation and corporate governance can affect the long-term value of its investments. B. The OIC also recognizes that voting rights have economic value.
8	THE INTEGRATION OF ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) FACTORS, SIMILAR TO OTHER INVESTMENT FACTORS, MAY HAVE A BENEFICIAL IMPACT ON THE ECONOMIC OUTCOME OF AN INVESTMENT AND AID IN THE ASSESSMENT OF RISKS ASSOCIATED WITH THAT INVESTMENT ■ A. The consideration of ESG factors within the investment decision-making framework is important in understanding the near-term and long-term impacts of investment decisions. ■ B. Over time, there has been an evolution of multi-factor, or more holistic approaches, to identify opportunities and remediate risks, in a large globally-diversified investment portfolio.
9	DIVERSITY, IN ALL ASPECTS, IS ACCRETIVE TO MEETING OIC OBJECTIVES ■ A. By embracing and enhancing diversity and inclusion efforts, the OIC ensures that the investment program will be exposed to and informed by a wide range of perspectives, ideas and opinions.



Public Equity Team



 Promoted in 2H 2022
 Joined the team in November 2022



Public Equity Performance

Strategic Role

The strategic role of OPERF public equity investments is outlined in OIC INV 1201 – Statement of OIC Investment and Management Beliefs and OIC Policy INV 601 – Strategic Role of Public Equity Securities within OPERF. As outlined in those policy documents, the strategic role of public equity is to generate a return premium relative to risk-free investments, while providing diversification benefits and liquidity in support of OPERF’s cash flow requirements. Return and risk objectives for the Public Equity Portfolio (outlined in OIC Policy INV 601 – Strategic Role of Public Equity Securities within OPERF) are as follows:

- 1) To achieve an excess portfolio return of 0.50 percent or more above the MSCI All Country World Investable Market Index (net) over a market cycle of three to five years on a net-of-fee basis; and
- 2) To manage active risk to a target annualized tracking error of 0.75 to 2.0 percent, relative to the MSCI ACWI IMI (net).

Trailing Performance

	Market Value	3 Months	YTD	1 Year	3 Years	5 Years	10 Years
OPERF Public Equity Portfolio	\$18.1B	-7.33%	-23.32%	-18.85%	4.01%	4.28%	7.78%
MSCI ACWI IMI (net)		-6.64%	-25.72%	-21.18%	3.64%	4.16%	7.25%
Excess Return		-0.69%	2.40%	2.33%	0.37%	0.12%	0.53%

Risk Statistics

		3 Months	YTD	1 Year	3 Years	5 Years	10 Years
OPERF Public Equity Tracking Error		N/A	N/A	3.15%	2.39%	1.92%	1.50%
OPERF Public Equity Information Ratio		N/A	N/A	0.79	0.24	0.15	0.35



Source: State Street, as of September 30, 2022.

Public Equity Benchmark

MSCI All Country World Investable Market Index (MSCI ACWI IMI)

Market Coverage

Holdings: 9,248

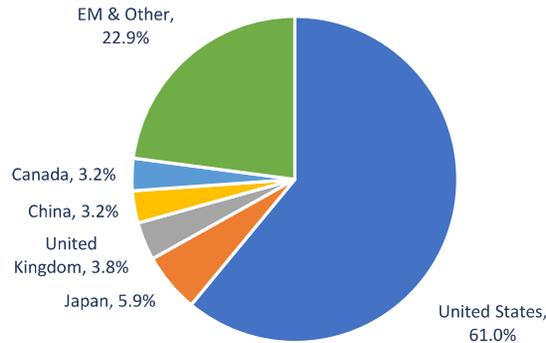
Countries: 47

- U.S. Equities: 61.0%
- International Developed Equities: 27.8% across 23 countries
- Emerging Markets Equities: 11.2% across 24 countries

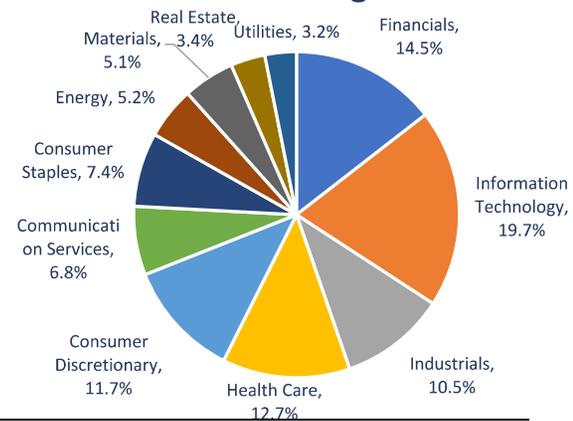
Top 10 Constituents

Issuer	Mkt Cap (USD BB)	Index Wt. (%)	Sector
Apple	2,237	3.83%	Info Tech
Microsoft Corp	1,655	2.83%	Info Tech
Alphabet A & C	1,118	1.91%	Cons Discr
Amazon.com	1,035	1.77%	Cons Discr
Tesla	701	1.20%	Cons Discr
UnitedHealth Group	474	0.81%	Health Care
Johnson & Johnson	430	0.74%	Health Care
Exxon Mobil Corp	368	0.63%	Energy
Berkshire Hathaway B	343	0.59%	Financials
Taiwan Semiconductor	345	0.56%	Info Tech

Country Weights



Sector Weights



Source: MSCI, as of September 30, 2022.



Public Equity Structure

Public equity represented 19.4% of OPERF as of September 30, 2022



Internally-managed portfolios comprise 39.1% of public equity assets



Source: State Street, as of September 30, 2022.

Public Equity Positioning

Strategic Allocation Targets

Allocation	Market Value (\$M)	Market Value (%)	OIC Target (%)	OIC Ranges
U.S.	10,411	57.5%	57.4%	+/- 10%
Int'l Developed	4,921	27.2%	30.5%	+/- 10%
Emerging	2,234	12.3%	12.5%	+/- 4%
Other (FX, Cash, etc.)	535	3.0%	0%	N/A

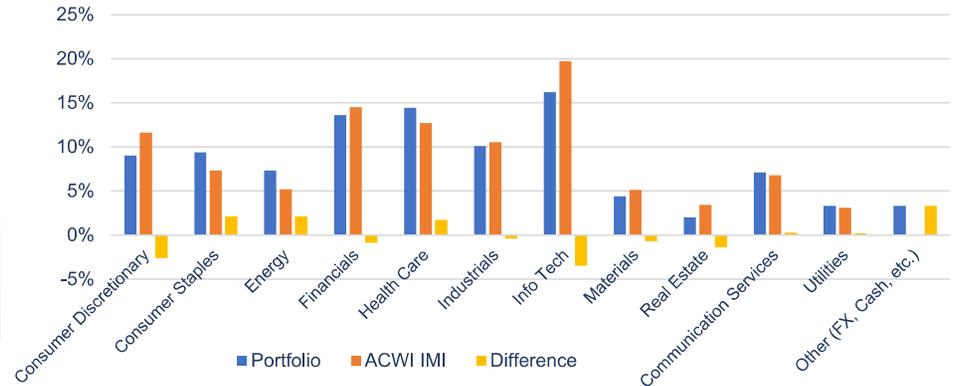
Top 10 Manager Strategies

Manager	Market value (\$M)	Market Value (%)
OST U.S. Risk Premia	2,909	16.1%
OST S&P 500	2,310	12.8%
DFA U.S. Large Cap Core	2,027	11.2%
Arrowstreet International 130/30	1,107	6.1%
OST International Risk Premia	1,035	5.7%
Arrowstreet Global Low Volatility	862	4.8%
LA Capital Management Global Low Volatility	791	4.4%
Lazard International Discounted Assets	731	4.0%
Acadian Global Low Volatility	625	3.5%
OST S&P 400	552	3.1%

Market Capitalization Weights

Market Capitalization	Market Value (\$M)	Market Value (%)	ACWI IMI Net (%)	Diff %
Mega Cap > \$200B	3,439	19.0%	24.9%	-5.9%
Large Cap \$10B-\$200B	9,902	54.7%	56.6%	-1.9%
Mid Cap \$6B-\$10B	1,231	6.8%	5.3%	1.5%
Small/Mid \$2B-\$6B	1,738	9.6%	8.5%	1.1%
Small Cap \$300M-\$2B	1,032	5.7%	4.6%	1.1%
Micro Cap <\$300M	181	1.0%	0.1%	0.9%
Other	579	3.2%	0.0%	3.2%
Total	18,102	100.0%	100.0%	0.0%

Sector Weights



Source: MSCI and State Street, as of September 30, 2022.

Public Equity – Internally Managed Portfolios

- Over 5 Years, all five portfolios have outpaced their respective benchmarks
- Since the inception of each portfolio, four of the five have outperformed

	Market Value (\$M)	3 Months	YTD	1 Year	3 Years	5 Years	10 Years	Since Inception	Inception Date
OST US Risk Premia	\$2,909	-6.63	-25.97	-19.83	5.20	7.45		9.44	1/1/2014
Risk Premia Custom Index		-6.62	-25.89	-19.76	5.20	7.42		9.45	
Excess Return		-0.01	-0.08	-0.07	0.00	0.03		-0.01	
MSCI USA Index		-4.70	-24.81	-17.23	8.13	9.19			
Excess Return		-1.93	-1.16	-2.60	-2.93	-1.74			
OST S&P 500 Index	\$2,310	-4.91	-23.90	-15.52	8.15	9.26	11.74	12.09	10/1/2009
S&P 500 Index		-4.88	-23.87	-15.47	8.16	9.24	11.70	12.05	
Excess Return		-0.03	-0.03	-0.05	-0.01	0.02	0.04	0.04	
OST S&P 400 Index	\$552	-2.46	-21.51	-15.31	5.98	5.90	10.23	11.24	10/1/2009
S&P MidCap 400 Index		-2.46	-21.52	-15.25	6.01	5.82	10.04	11.02	
Excess Return		0.00	0.01	-0.06	-0.03	0.08	0.19	0.22	
OST S&P 600 Index	\$267	-5.14	-23.22	-18.87	5.67	4.23	9.34	9.72	4/1/2010
S&P 600 Custom Index*		-5.20	-23.16	-18.83	5.48	4.13	8.86	9.13	
Excess Return		0.06	-0.06	-0.04	0.19	0.10	0.48	0.59	
OST Int'l Risk Premia	\$1,035	-11.08	-21.82	-17.90	1.19	1.64		2.27	6/1/2017
MSCI World Ex US Cust Multi-Factor Index		-11.13	-22.05	-18.17	0.81	1.30		1.96	
Excess Return		0.05	0.23	0.27	0.38	0.34		0.31	
MSCI World Ex US Index		-9.20	-26.23	-23.91	-1.21	-0.39			
Excess Return		-1.88	4.41	6.01	2.40	2.03			



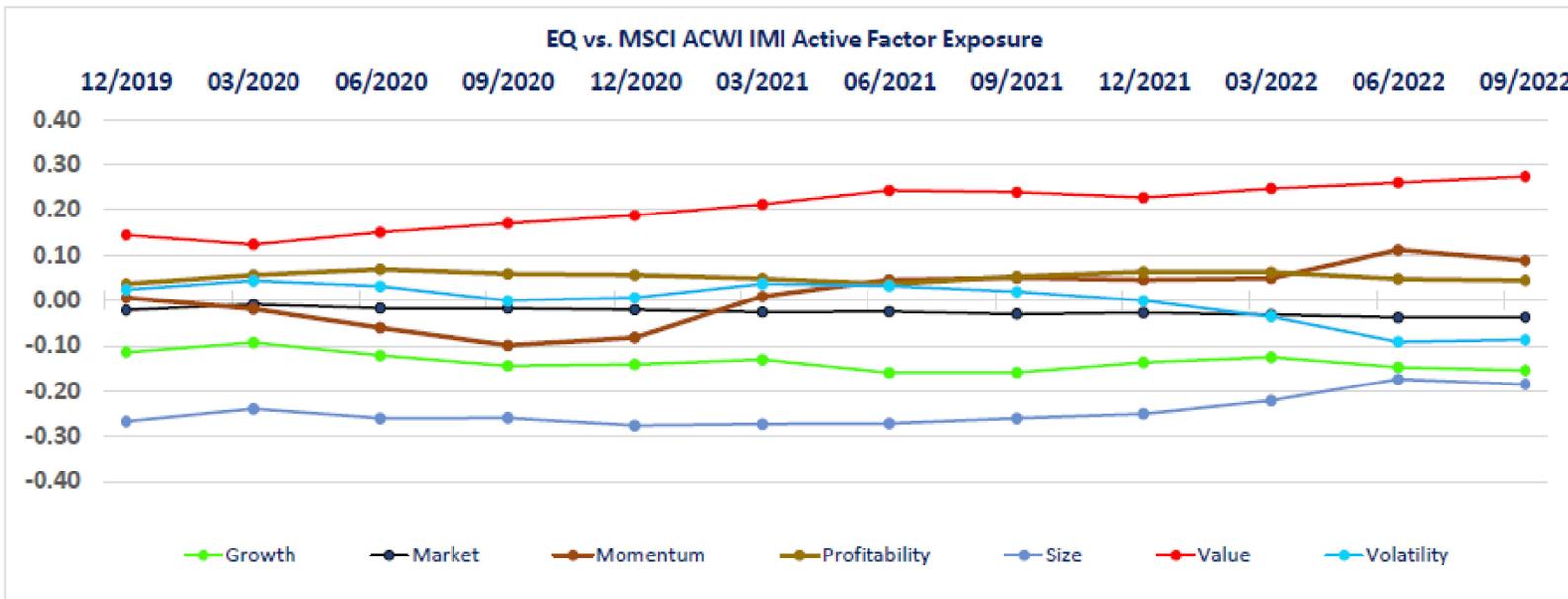
Source: State Street, as of September 30, 2022.

*From March 2010 to December 2018, the S&P Custom Index consisted of the Russell 2000 Index, and from January 2019 to present, consisted of the S&P 600 Index.

Public Equity by the Numbers

- **Foreign Exchange (FX) facilitation Program** – Since its inception in May 2019, the program has executed \$3.04B in FX trades through an electronic platform that allows for multiple counterparties to compete through a real-time auction process.
- **Private Equity Stock Distribution Program** – The internal program wound down in 2022 to allow the team to focus on its core mandates.
- **Manager Meetings** – For the 12-month period ending September 30, 2022, Staff held 80 “open door” meetings with prospective managers and conducted 100 existing manager meetings.
- **Global Peer Meetings** – Staff conducted 9 meetings since June 2022 as a forum for sharing ideas around internal trading, investment managers and portfolio design.
- **Portfolio Cash Raise** – For the 12-month period ending September 30, 2022, staff raised \$4.75B for PERS benefit payments and private market capital calls.

Public Equity Active Factor Exposure

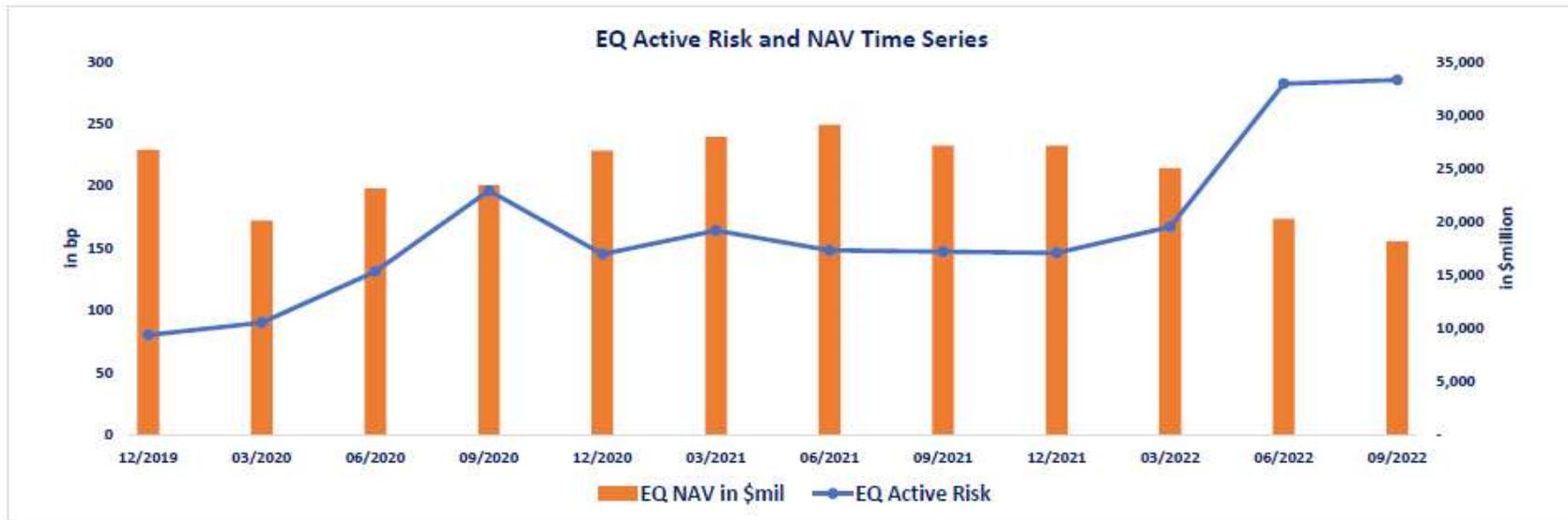


As of 9/30/22 public equity exhibited meaningful exposure to the value factor while underweight size and volatility.



Source: OST Risk & Research, BRS Aladdin.

Public Equity Active Risk Time Series



- The portfolio also exhibited elevated active risk as of the quarter end.

All things considered (2021)...

- Staff continues to evaluate exposures with respect to size and value along with low volatility.



Source: OST Risk & Research, BRS Aladdin.

Public Equity Path Forward - Simplicity

Phase One

- Transition to neutral portfolio exposures along the dimensions of style, capitalization and factors relative to the policy benchmark.
 - Minimize benchmark misfits will reduce unintended biases which have led to pronounced over and underperformance from public equity
- Maintain passive core exposure in U.S. equity; add passive exposure to the international sleeve.
- Revisit factors selected for the U.S. and International Risk Premia portfolios.
- Emphasis on alpha generation from high conviction active managers.

Phase Two

- Continue to optimize portfolio weights to risk and exposure characteristics.

Periodic Table of Style Rotation

Exposure across investment styles may help minimize the volatility of returns

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	3 Qtrs. 2022
Emerging Market Value 62.87%	Emerging Market Value 31.19%	Emerging Market Growth 35.40%	Emerging Market Growth 32.75%	Emerging Market Value 42.71%	U.S. Fixed 5.24%	Emerging Market Value 79.69%	Small Cap Growth 29.09%	U.S. Fixed 7.84%	Emerging Market Growth 20.86%	Small Cap Growth 43.30%	Large Cap Growth 14.89%	Large Cap Growth 5.52%	Small Cap Value 31.74%	Emerging Market Growth 47.12%	Cash Equivalent 1.87%	Large Cap Value 31.93%	Small Cap Growth 34.63%	Large Cap Growth 32.01%	Cash Equivalent 0.61%
Emerging Market Growth 49.61%	Dev ex-U.S. Value 24.47%	Emerging Market Value 33.64%	Emerging Market Value 32.53%	Emerging Market Growth 36.96%	Cash Equivalent 2.06%	Emerging Market Growth 78.38%	Small Cap Value 24.50%	Large Cap Growth 4.65%	Small Cap Value 18.05%	Small Cap Value 34.52%	Large Cap Value 12.36%	Dev ex-U.S. Growth 1.65%	Large Cap Value 17.40%	Emerging Market Value 28.67%	U.S. Fixed 0.01%	Large Cap Growth 31.13%	Large Cap Growth 33.47%	Small Cap Value 28.27%	U.S. Fixed -14.61%
Small Cap Growth 48.54%	Small Cap Value 22.25%	Dev ex-U.S. Value 14.54%	Dev ex-U.S. Value 29.32%	Dev ex-U.S. Growth 18.03%	Small Cap Value -28.92%	Dev ex-U.S. Value 36.75%	Emerging Market Growth 19.58%	Cash Equivalent 0.10%	Large Cap Value 17.68%	Large Cap Growth 32.75%	U.S. Fixed 5.97%	U.S. Fixed 0.55%	Emerging Market Value 15.48%	Dev ex-U.S. Growth 27.61%	Large Cap Growth -0.01%	Small Cap Growth 28.48%	Emerging Market Growth 31.58%	Large Cap Value 24.90%	Large Cap Value -16.56%
Small Cap Value 46.03%	Emerging Market Growth 20.90%	Dev ex-U.S. Growth 14.41%	Small Cap Value 23.48%	Large Cap Growth 9.13%	Large Cap Growth -34.92%	Small Cap Growth 34.47%	Emerging Market Value 18.80%	Large Cap Value -0.48%	Dev ex-U.S. Value 17.29%	Large Cap Value 31.99%	Small Cap Growth 5.60%	Cash Equivalent 0.05%	Small Cap Growth 11.32%	Large Cap Growth 27.44%	Large Cap Value -8.95%	Dev ex-U.S. Growth 27.92%	Dev ex-U.S. Growth 18.41%	Dev ex-U.S. Value 13.26%	Dev ex-U.S. Value -20.10%
Dev ex-U.S. Value 45.96%	Dev ex-U.S. Growth 16.27%	Large Cap Value 5.82%	Dev ex-U.S. Growth 22.12%	Small Cap Growth 7.05%	Small Cap Growth -38.54%	Large Cap Growth 31.57%	Large Cap Value 15.10%	Small Cap Growth -2.91%	Emerging Market Value 16.40%	Dev ex-U.S. Value 21.47%	Small Cap Value 4.22%	Small Cap Growth -1.38%	Emerging Market Growth 7.87%	Small Cap Growth 22.17%	Small Cap Growth -9.31%	Emerging Market Growth 25.44%	U.S. Fixed 7.51%	Dev ex-U.S. Growth 11.57%	Small Cap Value -21.12%
Dev ex-U.S. Growth 32.99%	Large Cap Value 15.71%	Small Cap Value 4.71%	Large Cap Value 20.81%	U.S. Fixed 6.97%	Large Cap Value -39.22%	Dev ex-U.S. Growth 30.66%	Large Cap Growth 15.05%	Small Cap Value -5.50%	Dev ex-U.S. Growth 15.48%	Dev ex-U.S. Growth 20.53%	Cash Equivalent 0.03%	Large Cap Value -3.13%	Dev ex-U.S. Value 7.39%	Dev ex-U.S. Value 21.04%	Emerging Market Value -10.26%	Small Cap Value 22.39%	Emerging Market Value 5.97%	Emerging Market Value 4.50%	Emerging Market Value -22.93%
Large Cap Value 31.79%	Small Cap Growth 14.31%	Small Cap Growth 4.15%	Small Cap Growth 13.35%	Dev ex-U.S. Value 6.95%	Dev ex-U.S. Growth -42.88%	Large Cap Value 21.17%	Dev ex-U.S. Growth 13.06%	Dev ex-U.S. Value -11.69%	Large Cap Growth 14.61%	Cash Equivalent 0.07%	Emerging Market Growth -0.09%	Small Cap Value -7.47%	Large Cap Growth 6.89%	Large Cap Value 15.36%	Small Cap Value -12.86%	Dev ex-U.S. Value 17.02%	Small Cap Value 4.63%	Small Cap Growth 2.83%	Small Cap Growth -29.28%
Large Cap Growth 25.66%	Large Cap Growth 6.13%	Large Cap Growth 4.00%	Large Cap Growth 11.01%	Cash Equivalent 5.00%	Dev ex-U.S. Value -44.29%	Small Cap Value 20.58%	U.S. Fixed 6.54%	Dev ex-U.S. Growth -12.71%	Small Cap Growth 14.59%	Emerging Market Growth 0.07%	Dev ex-U.S. Growth -3.26%	Dev ex-U.S. Value -7.68%	U.S. Fixed 2.65%	Small Cap Value 7.84%	Dev ex-U.S. Growth -13.14%	Emerging Market Value 12.54%	Large Cap Value 1.36%	Cash Equivalent 0.05%	Large Cap Growth -30.41%
U.S. Fixed 4.10%	U.S. Fixed 4.34%	Cash Equivalent 3.07%	Cash Equivalent 4.85%	Large Cap Value 1.99%	Emerging Market Value -50.08%	U.S. Fixed 5.93%	Dev ex-U.S. Value 4.82%	Emerging Market Value -17.57%	U.S. Fixed 4.21%	U.S. Fixed -2.02%	Emerging Market Growth -3.60%	Emerging Market Growth -11.12%	Cash Equivalent 0.33%	U.S. Fixed 3.54%	Dev ex-U.S. Value -15.06%	U.S. Fixed 8.72%	Cash Equivalent 0.67%	U.S. Fixed -1.54%	Emerging Market Growth -30.49%
Cash Equivalent 1.15%	Cash Equivalent 1.33%	U.S. Fixed 2.43%	U.S. Fixed 4.33%	Small Cap Value -9.78%	Emerging Market Growth -56.20%	Cash Equivalent 0.21%	Cash Equivalent 0.13%	Emerging Market Growth -18.77%	Cash Equivalent 0.11%	Emerging Market Value -4.70%	Dev ex-U.S. Value -5.41%	Emerging Market Value -18.16%	Dev ex-U.S. Growth -1.87%	Cash Equivalent 0.86%	Emerging Market Growth -18.04%	Cash Equivalent 2.28%	Dev ex-U.S. Value -3.22%	Emerging Market Growth -8.24%	Dev ex-U.S. Growth -32.33%



Source: Callan.

MSCI World Factors Index performance

Exposure across factors may help minimize the volatility of returns

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Q3 2022
VI	Vo	VI	VI	Mt	VI	Mt	Vo	Sz	Sz	Vo	Sz	VI	Vo	Vo	Yd	Mt	Vo	Qy	Mt	Qy	Yd
-4.50%	-9.60%	56.70%	28.60%	28.40%	31.00%	19.90%	-29.20%	42.00%	18.20%	8.00%	16.70%	32.70%	12.10%	5.80%	10.30%	32.60%	-1.40%	36.70%	28.70%	26.10%	-16.17%
Yd	Yd	Sz	Sz	VI	Yd	Qy	Qy	VI	Mt	Yd	World	GT	Qy	Mt	Sz	Qy	Mt	World	Qy	World	Vo
-8.00%	-9.80%	50.40%	24.10%	17.20%	28.90%	16.80%	-33.50%	41.90%	16.50%	4.80%	16.50%	30.73%	9.00%	4.50%	9.40%	26.60%	-2.40%	28.40%	22.73%	22.35%	-17.60%
Vo	Sz	GT	Mt	Sz	Sz	GT	GT	Yd	Vo	Mt	VI	Mt	Mt	Qy	GT	GT	Qy	Mt	GT	VI	VI
-10.00%	-13.60%	40.11%	21.30%	15.20%	22.10%	11.39%	-37.80%	33.80%	12.80%	4.80%	15.00%	30.30%	7.00%	4.20%	8.94%	26.43%	-5.10%	28.30%	18.06%	20.77%	-21.97%
Sz	Mt	Yd	Vo	GT	GT	VI	Mt	Qy	World	Qy	Mt	Qy	World	GT	VI	Sz	Yd	GT	World	GT	GT
-11.50%	-14.40%	30.50%	20.80%	13.19%	21.63%	10.30%	-39.90%	33.50%	12.30%	4.40%	14.80%	27.70%	5.50%	1.24%	8.90%	23.90%	-6.70%	27.44%	16.50%	18.19%	-24.47%
Qy	VI	World	Yd	World	Vo	World	World	GT	Qy	World	GT	World	VI	World	Vo	World	World	Sz	Sz	Yd	World
-12.10%	-15.10%	33.80%	20.00%	10.00%	21.20%	9.60%	-40.30%	31.90%	11.40%	-5.00%	14.31%	27.40%	4.60%	-0.30%	8.20%	23.10%	-8.20%	24.50%	10.12%	16.81%	-25.13%
World	Qy	Vo	GT	Yd	World	Yd	Sz	World	GT	GT	Qy	Sz	GT	Sz	World	VI	GT	Yd	Vo	Sz	Sz
-16.50%	-16.50%	26.00%	19.32%	8.50%	20.70%	7.30%	-41.90%	30.80%	9.33%	-6.25%	13.70%	26.50%	4.55%	-1.00%	8.20%	22.90%	-8.50%	24.30%	3.26%	15.40%	-25.97%
Mt	GT	Mt	World	Vo	Mt	Sz	Yd	Vo	VI	Sz	Yd	Yd	Sz	Yd	Qy	Yd	Sz	Vo	Yd	Mt	Mt
-20.50%	-19.37%	25.90%	15.20%	8.30%	19.10%	6.40%	-42.40%	17.20%	9.10%	-9.30%	13.30%	22.90%	3.40%	-2.40%	5.10%	19.20%	-11.80%	24.00%	0.95%	14.95%	-26.94%
GT	World	Qy	Qy	Qy	Qy	Vo	VI	Mt	Yd	VI	Vo	Vo	Yd	VI	Mt	Vo	VI	VI	VI	Vo	Qy
-19.41%	-19.50%	22.00%	12.70%	6.00%	16.80%	6.10%	-42.60%	14.80%	7.20%	-11.00%	8.90%	19.40%	3.30%	-2.70%	4.70%	18.00%	-13.40%	19.80%	-3.35%	14.84%	-29.17%

VI = Enhanced Value Yd = Dividend Yield Vo = Volatility Sz = Sml Size Qy = Quality Mt = Momentum GT = Growth



Source: MSCI.

The Case for Volatility

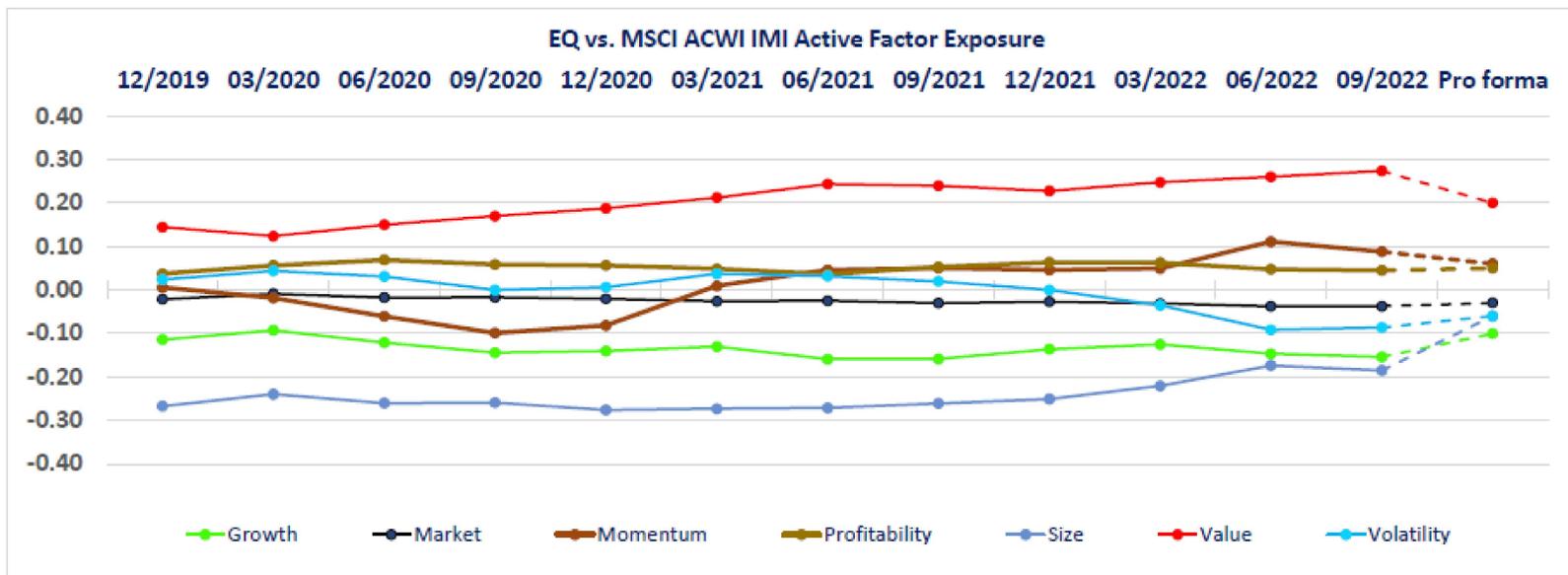
We are not timing the recovery, but believe the path forward will lead equity markets higher and exposure to volatility can be additive

Goldman Sachs Path of S&P 500: Soft vs. Hard landing scenarios
S&P 500 falls to 3600 in soft landing, but 3150 if investors price hard landing



Source: Goldman Sachs

Modeled Public Equity Active Factor Exposure

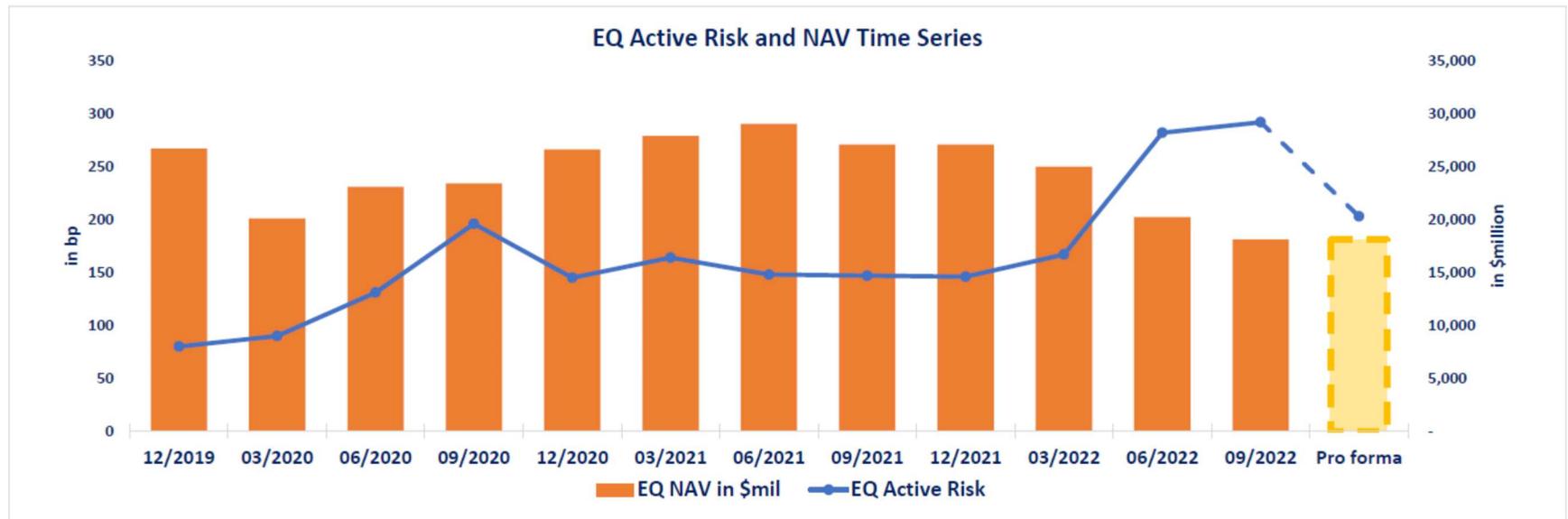


We believe that the recommended reallocation of portfolio assets will reduce value exposure, and underweights to size and volatility,



Source: OST Risk & Research, BRS Aladdin.

Modeled Public Equity Active Risk Time Series



and bring the portfolio's active risk back to within the target range.



Source: OST Risk & Research, BRS Aladdin.

Public Equity Timeline

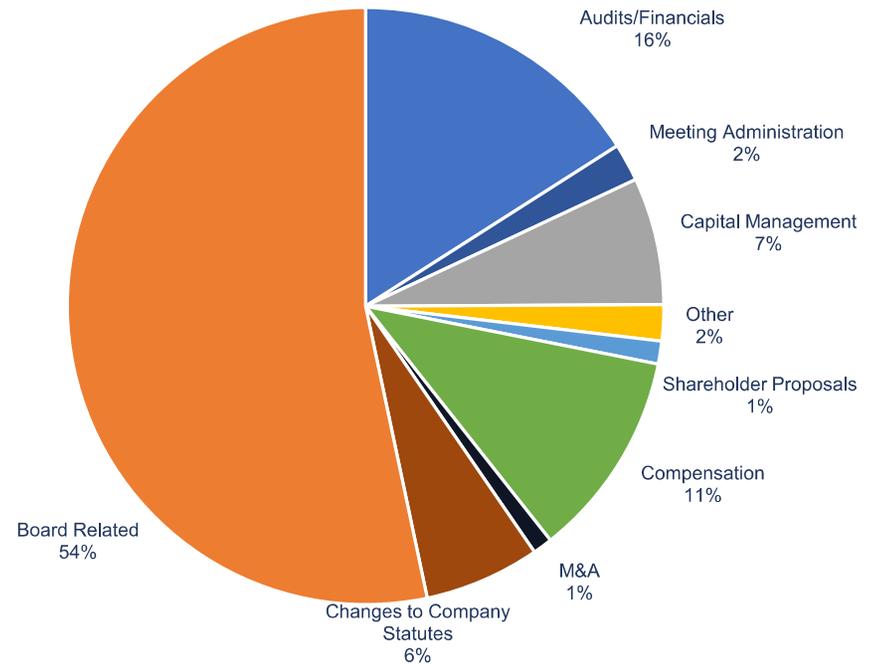


ESG Update

What We're Currently Working On

- **ESG Data Vendor Subscriptions**
 - Monthly and quarterly ESG reporting planned for 1Q23
 - MSCI ESG Manager
 - ISS ESG
- **Proxy Voting**
 - As of September 30, Staff voted 93,004 proxy votes over the one-year period through Glass Lewis
 - Of that number, 75 proxies were voted manually
- **Projects/Conferences**
 - External Manager PACTA (Paris Agreement Capital Transition Assessment) exercise
 - Council of Institutional Investors conference attendance

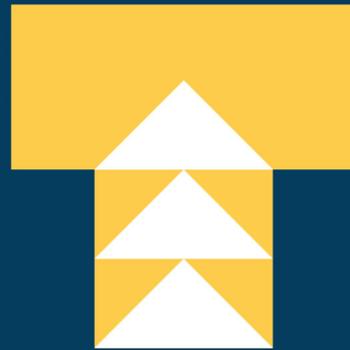
Proposal Categories



Source: Glass Lewis.

2023 Goals

- Rebalance OPERF Public Equity Portfolio
- Establish reporting for ESG carbon metrics
- Work with Meketa on DEI manager review
- Securities lending program review



OREGON STATE TREASURY

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OPERF Public Equity Portfolio Structure Review

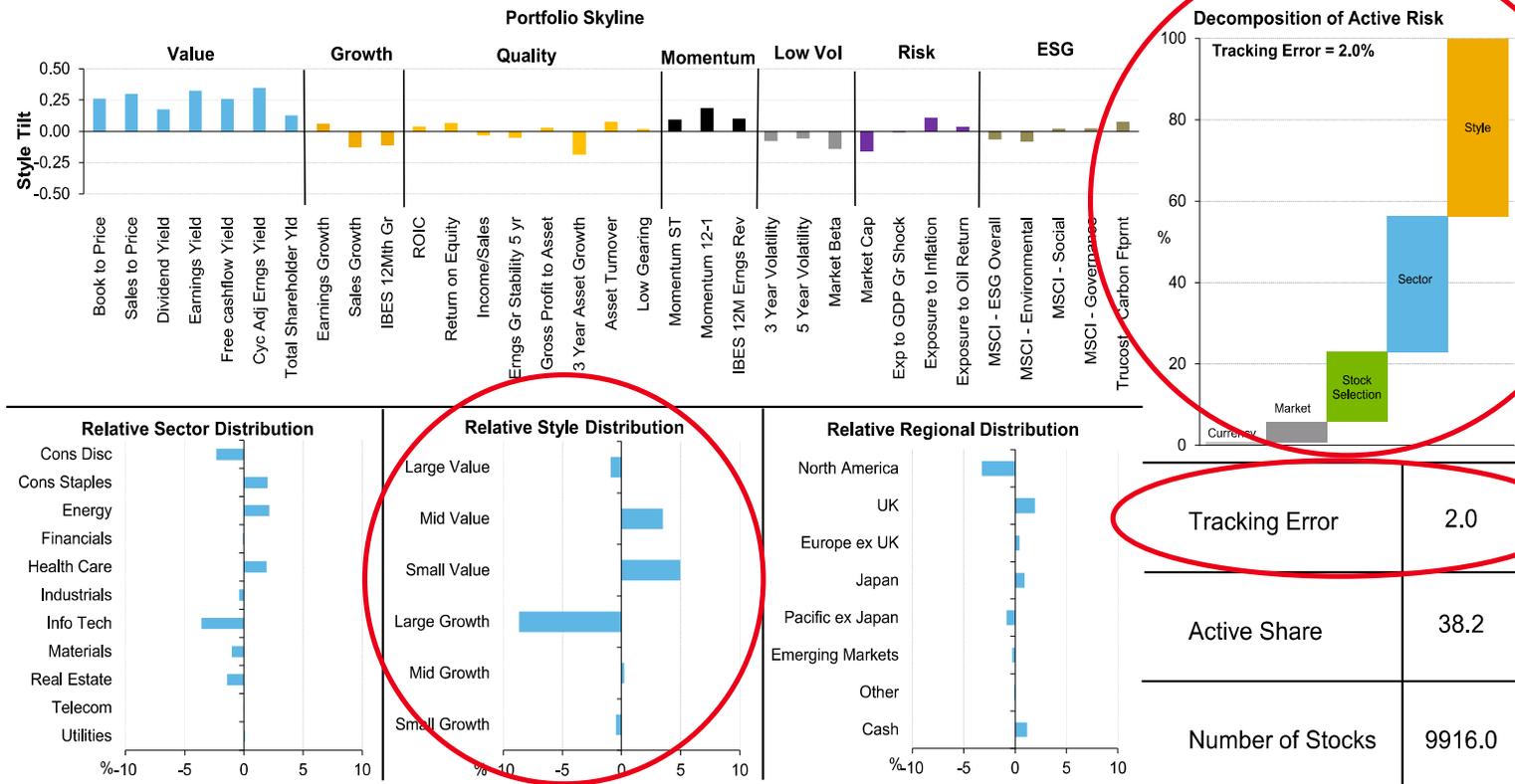
November 2022

November 2022

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Portfolio 1: Current Total Public Equity



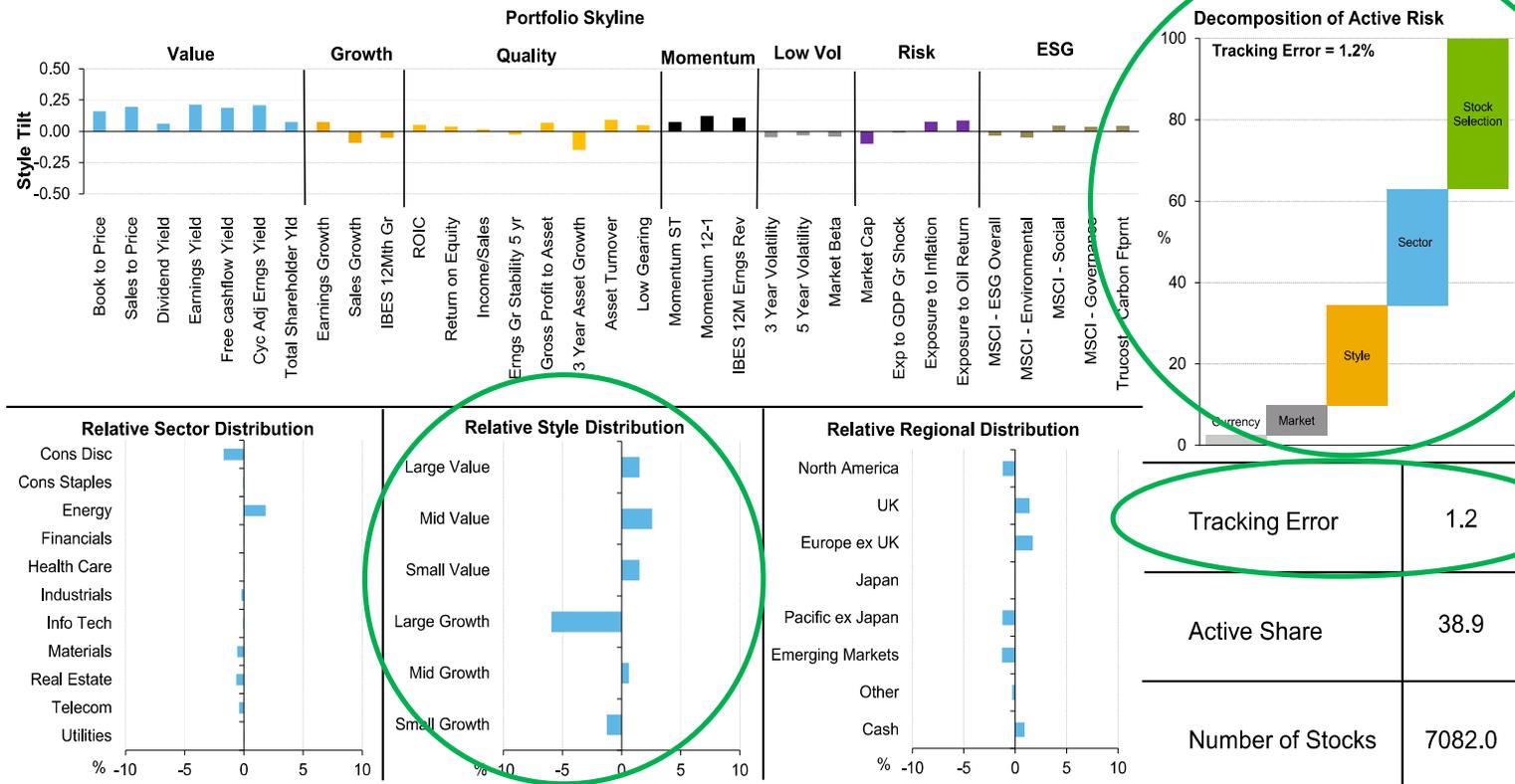
Source: Aon, Style Research. Portfolio Skyline Data as at 30 September 2022.

Distribution and TE Data as at 30 September 2022. Benchmark: MSCI ACWI IMI

Tracking Error	2.0
Active Share	38.2
Number of Stocks	9916.0



Portfolio 2: Proposed New Total Public Equity



Source: Aon, Style Research. Portfolio Skyline Data as at 30 September 2022.

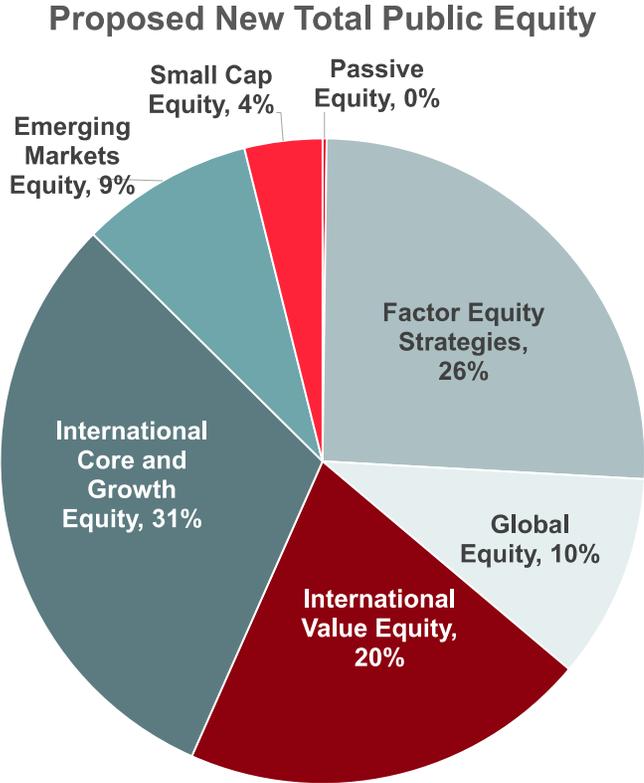
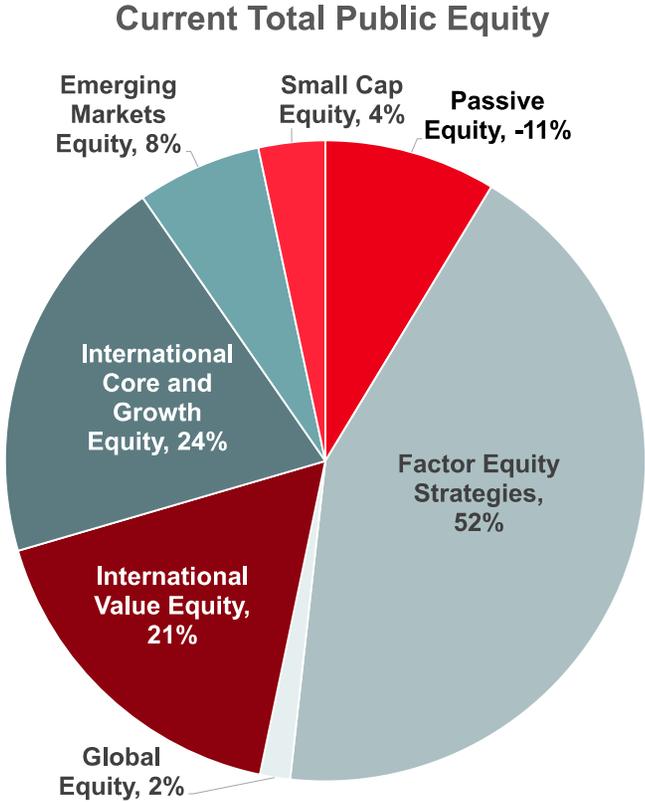
Distribution and TE Data as at 30 September 2022. Benchmark: MSCI ACWI IMI

Tracking Error	1.2
Active Share	38.9
Number of Stocks	7082.0



Tracking Error Contribution

Current Total Public Equity vs. Proposed New Total Public Equity



Conclusions

The proposed new total public equity portfolio delivers a more balanced portfolio reducing biases across market capitalization, style, and factors.

- Market Capitalization/ Style/ Factor Tilts
 - Reducing overweight tilts to small/mid-cap value equity
 - Reducing underweight tilts to large-cap growth equity
 - Inclusion of broader global equity mandates reduces the emphasis on low volatility factors
 - Broadening risk premia strategies to represent multi-factor approach also reduces style biases

As a result, the efficiency of the portfolio improves as tracking error decreases while the contribution to active risk is more balanced representing a range of diversified sources of alpha potential.

- Active Risk
 - The key contributor to tracking error for the proposed new total public equity portfolio is stock selection
 - Driven by reducing portfolio structure biases as well as holding an emphasis on high conviction active managers
 - The contribution to tracking error across strategies is more balanced
 - Factor investing contribution to tracking error decreases from 52% to 26%
 - Global equity contribution to tracking error increases from 2% to 10%



Appendix



Style Research Output Manual

Portfolio Skyline:

- The skylines are designed to answer the question "How significantly different is the portfolio from the benchmark?" in respect to Style factors which are important in equity markets.
- The first six bars from the left are value factors (shown as blue bars) while the next four bars are growth factors (green bars). The next six bars are quality factors (amber) whilst the dark and light grey bars represent momentum and risk factors, respectively.
- A bar above the axis indicates that the portfolio has a positive tilt towards that factor e.g., in the case of value factors, if the bar is above axis, then the portfolio has a tilt towards cheaper companies.
 - As a rule of thumb, for any individual Style tilt:
 - Style tilts less than -0.5 or more than +0.5 indicate a tilt is observable
 - Style tilts less than -1 or more than +1 are significant

Value Measures:

- Book to Price - The ratio of the company's Book Value (the sum of Shareholders' Equity plus accumulated Retained Earnings from the P & L Account) to its Share Price.
- Sales to Price - Net Sales per Share divided by the Share Price.
- Dividend Yield - The annual Dividend Paid per Share divided by the Share Price.
- Earnings Yield - Annual Earnings (adjusted for Amortizations of Intangibles, Extraordinary charges and credits) per Share divided by the Share Price.
- Free cash flow Yield - Annual Cash Flow per share minus Capital Expenditure per share divided by the share price. Free cash flow is the amount of money available to the company after paying out for the maintenance and renewal of fixed assets
- Cyclically Adjusted Earnings Yield – 10 years average of cyclically adjusted annual earnings (adjusted for Amortizations of Intangibles, Extraordinary charges and credits) per Share divided by the Share Price.
- Total Shareholder Yield – The sum of Net Buyback Yield and Net Debt Paydown yield. This factor measures the proportion of a company's value distributed to shareholders through dividend payments, share repurchases and debt reduction.



Style Research Output Manual – cont.

Growth measures:

- Earnings Growth - The average annual growth rate of Earnings (adjusted for Amortizations of Intangibles, Extraordinary charges and credits) over a trailing three years.
- Sales Growth - The average annual growth rate of Net Sales per Share over a trailing three years.
- IBES 12M Growth - IBES consensus forecast growth of Earnings over the next twelve months.

Quality Measures:

- Book to Price - The ratio of the company's Book Value (the sum of Shareholders' Equity plus accumulated Retained Earnings from the P & L Account) to its Share Price.
- Return on Invested Capital - $(\text{Net Income} + ((\text{Interest Expense on Debt} - \text{Interest Capitalized}) * (1 - \text{Tax Rate}))) / \text{Average of Last Year's and Current Year's (Total Capital} + \text{Short Term Debt} \& \text{Current Portion of Long-Term Debt})$. The Return on Invested Capital (also known as Return on Capital) measures the profitability of a company as measured by its operating income in relation to the total capital invested in the company.
- Return on Equity - Net Income before Preferred Dividends divided by the Book Value of Shareholders' Common Equity.
- Income to Sales - The "net margin", annual Net Income before Preferred Dividends (plus Policyholders' Surplus for insurance companies), divided by annual Net Sales.
- Earnings Growth Stability - This 'Quality' factor is calculated as the negative of the standard deviation of Earnings Growth over the most recent 5 years of growth data.
- Gross Profit to Assets – Gross Profits divided by Total Assets. Gross profit is a company's total revenue minus the cost of goods sold. Gross profit may be preferred as an alternative over earnings or free cash flow to consider a company's true economic profitability without subtracting expenses that may in fact be increasing a company's production advantage or competitive advantage e.g. advertising , R&D, or capital expenditure. Gross profits are divided by assets, not shareholder's equity, because gross profits exclude interest payments, and are therefore independent of leverage.
- 3 Year Asset Growth – The average annual growth rate of total assets over a trailing three years.
- Asset Turnover - Net Sales /Total Assets. The asset turnover ratio is an indicator of how efficient a company is in deploying its assets to generate revenue.
- Low Gearing - The negative of Debt to Equity. Low geared companies can be regarded as being of higher "Quality" as they are less burdened by debt repayment costs.



Style Research Output Manual – cont.

Momentum measures:

- IBES 12M Growth - IBES consensus forecast growth of Earnings over the next twelve months. ST Momentum - Calculated using a 6 month "memory" of monthly total returns. The past period returns are weighted using a "decay ratio" of 2/3, per month.
- Momentum 12-1 – The total return of the stock over the last 12 months, excluding the total return over the most recent month since reversal effects are often associated with one-month returns.
- IBES 12M Earnings Revisions - IBES balance of Earnings forecast revisions for the next annual reporting period.

Low Volatility Measures:

- 3 Year Volatility – The standard deviation of the last 36 months of total returns, expressed as an annualized percentage.
- 5 Year Volatility – The standard deviation of the last 60 months of total returns, expressed as an annualized percentage.
- Market Beta - The "slope coefficient" from the simple regression.



Style Research Output Manual – cont.

Risk measures:

- Market Capitalisation - The average Size statistic of a portfolio is the weighted (by holding value) average size of the securities held. The average Size statistic of a benchmark (or total market) is the weighted (by holding value) average size of the securities within the benchmark (or total market). If the bar is above the line, there is a large cap bias whilst a bar below the line indicates a mid/small cap bias.
- Market Beta – The "slope coefficient", (β), from the simple regression: Security Monthly Return = $\alpha + \beta * \text{Market Monthly Return} + \text{Random Error}$. The regression is carried out over 36 months periods; where sufficient information is not available, $\beta=1$ is assumed.
- Exposure to GDP Shock Beta – Based on the equation: Quarterly Share Price Return of Security $n = \alpha n + \beta n \text{GDP Shock}$. Where GDP Shock is the difference between the most recent GDP quarterly growth rate and the average of the previous 4 quarters. A number of, say, 2.5 would mean that a GDP growth rate of 1% (quoted at an actual quarter to quarter rate) above the average of GDP growth rates recorded over the previous 4 quarters would result in the value of the stock/sector/portfolio being 2.5% (= 2.5 x 1%) higher in the current quarter than would otherwise have been.
- Exposure to Inflation Beta – Based on the equation: Monthly Share Price Return of Security $n = \alpha n + \beta n \text{Monthly Inflation Rate}$. Where Monthly Inflation is quoted at an annual rate. A number of, say, 0.8 would mean that a rise in the annual rate of inflation by 1% (quoted at an annual rate) would result in the performance of the stock/sector/portfolio being 0.8% (= 0.8 x 1%) stronger in the current month than would otherwise have been.
- Exposure to Oil Beta - Based on the equation: Monthly Share Price Return of Security $n = \alpha n + \beta n \text{Oil Price Return}$. Where the Oil Price Return is the monthly per cent change in the Oil Price, in US dollars. A number of, say, 0.7 would mean that an increase of 1% in the US dollar price of oil would result in the value of the stock/sector/portfolio being 0.7% (= 0.7 x 1%) higher in the current month than would otherwise have been.

Decomposition of Active Risk:

- Risk attribution breaks down the Tracking Error into the main sources of risk i.e., from currency allocation, market (country) allocation, sector allocation, Style allocation and stock selection (or equity risk). These are displayed as percentages and provide further insights into the sources of risk in a portfolio.

Style Research Output Manual – cont.

Risk measures:

- Tracking Error - Estimate of the expected relative volatility of the portfolio versus the benchmark and is expressed as an annualised percentage.
- Benchmark Overlap– Measure of the percentage of stock holdings in a manager's portfolio that differ from the benchmark index. A high Active share indicates large differences between the portfolio and benchmark in terms of holdings while a portfolio with a low active share will conclude that there is a reasonable overlap between the portfolio and the benchmark.
- Number of Stocks - The number of stocks contained in the portfolio.

Relative Style Distribution:

- The distribution shows the relative style distribution analysis according to Market Cap and Book to Price based on the Benchmark.
- Large, Mid, Small = Market Cap (70%, 20%, 10%); Value, Growth = Book to Price (50%, 50%).

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Public Equity Program Insights

December 2022



Public Equity Program Insights

What a Difference a Year Makes

Takeaways:

- In 2021, Meketa highlighted the history of the OPERF portfolio's factor tilts, and provided an assessment of the risks (and benefits) that these tilts introduce in portfolio construction.
 - One area of discussion was the value risk premium, and whether its thesis remained
- Some of the factor biases discussed have protected capital in the OPERF portfolio in 2022:
 - Value, in particular, has been a tailwind to relative performance this year in OPERF's US small cap portfolios (small cap>large cap YTD, and value>growth YTD)
 - Global Low Vol strategies have also outperformed in 2022. (800 basis points of relative outperformance when compared to the MSCI ACWI benchmark YTD)
- Staff has outlined a new direction for the portfolio, removing many of the biases inherent in the portfolio construction. The main stated goal is: Simplicity
 - Reducing value bias
 - Reducing Global Low Vol exposure
 - Reduce overall active risk in portfolio, by focusing on passive exposure in efficient markets, and active risk outside the US
 - Re-underwriting active managers across the public equity roster
- Meketa is supportive of Staff's efforts and the direction of the OPERF portfolio going forward



Meketa is Supporting Staff in Their Efforts to Re-Underwrite the Equity Portfolio

- Conducting manager diligence on current strategies and potential strategies, to ensure that active dollars are being spent on high conviction names and strategies
- Reviewing portfolio construction alongside Staff and Aon to ensure the portfolio represents the opportunity set
- Will assist with cash flow planning/rebalancing as indicated by the Asset Allocation decision made by the OIC
- Available to assist with modeling of Tracking Error risk, and active risk within considered portfolio strategies
- Ensuring that fees are a focus-only pay for active if the net benefit is expected to be positive

O I C



OREGON
STATE
TREASURY

TAB 6
OPERF Q3
PERFORMANCE REVIEW

Oregon Investment Council

December 7, 2022

Q3 Performance Update
As of September 30, 2022

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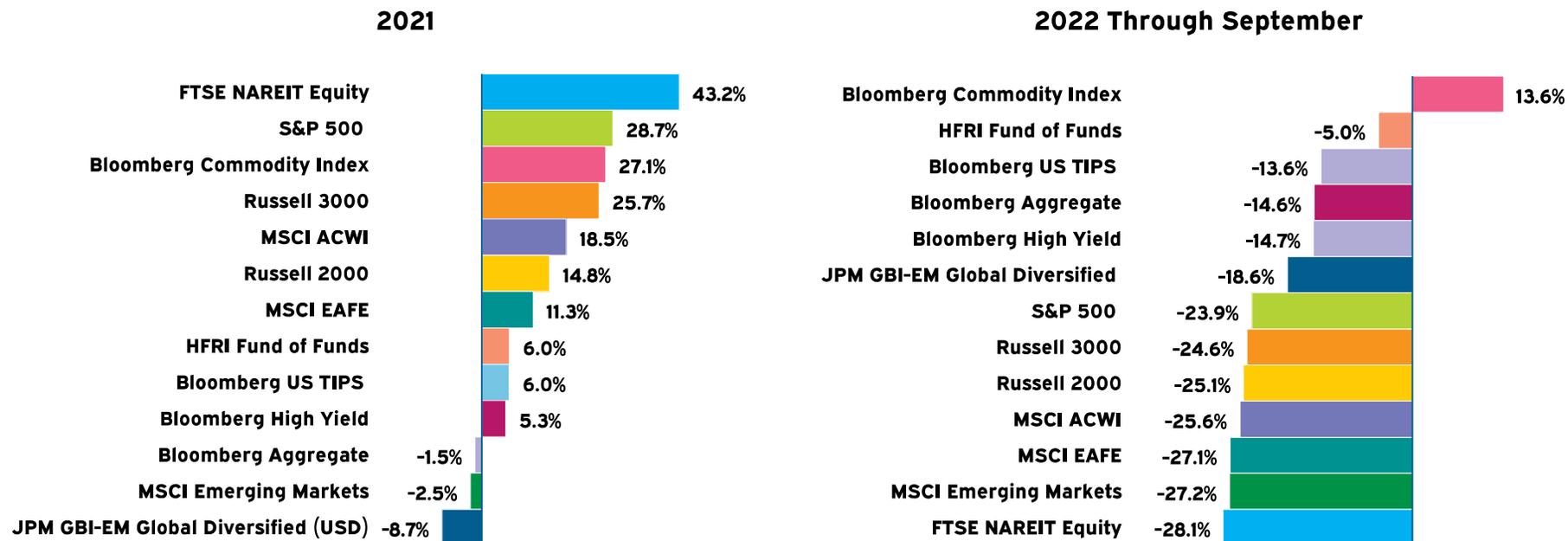
1. Economic and Market Update as of September 30, 2022
2. Executive Summary Q3 2022
3. Performance Update as of September 30, 2022
4. Disclaimer, Glossary, and Notes

Economic and Market Update
Data as of September 30, 2022

Commentary

- After a strong July, global markets sold off in August and September, leading to quarterly declines as slower growth and higher inflation weighed on sentiment.
- The Federal Reserve maintained its aggressive tightening campaign with future hikes expected as US inflation continues to surprise to the upside and labor markets remain tight.
 - In Europe, inflation hit a multi-decade high on energy prices. In the UK, Liz Truss became the new prime minister with her government quickly announcing a fiscal package in September. The proposal was poorly received by markets, as it undermined efforts of the central bank to lower inflation.
 - Equity markets significantly declined for the month leading to quarterly losses with international markets declining the most. The war in Ukraine has elevated prices in Europe, while tight COVID-19 policies, slowing growth, and property market issues have weighed on China. Continued US dollar strength has been a further headwind.
 - For the quarter, in a reversal of the prior trend, growth outpaced value across the capitalization spectrum but continued to trail year-to-date.
 - Interest rates rose significantly across the US yield curve for the month and quarter with the curve remaining inverted (ten-year yield minus the two-year yield) by 44 basis points. This is by far the worst start to a calendar year for bond investors.
- Persistently high inflation and the likely increased pace of the policy response, the war in Ukraine, lingering COVID-19 issues, and lockdowns in China will all have considerable consequences for the global economy.

Index Returns¹

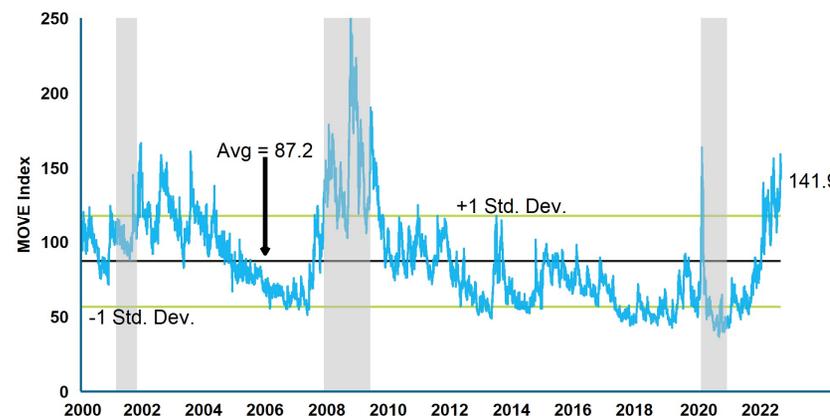
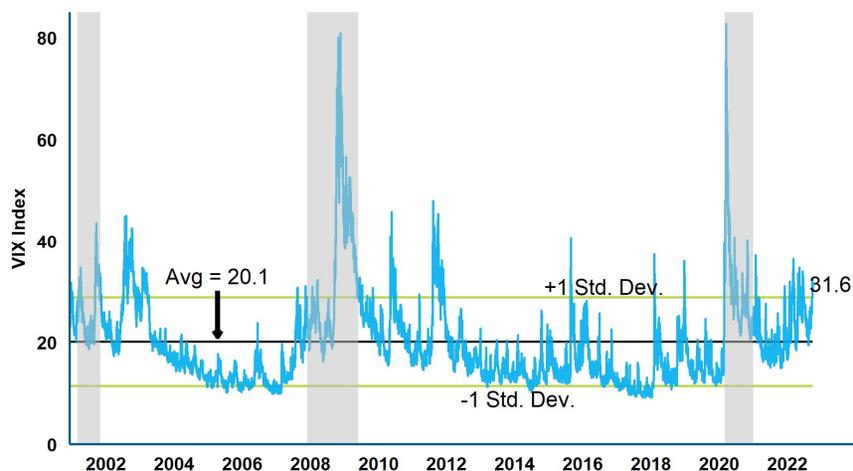


→ Except for emerging markets and the broad US investment grade bond market (Bloomberg Aggregate), most asset classes appreciated in 2021.

→ After a brief rally in July most asset classes declined significantly in August and September as it became clear further policy tightening would be taken to try to control inflation. Except for commodities, all major assets classes have experienced significant declines year-to-date.

¹ Source: Bloomberg and FactSet. Data is as of September 30, 2022.

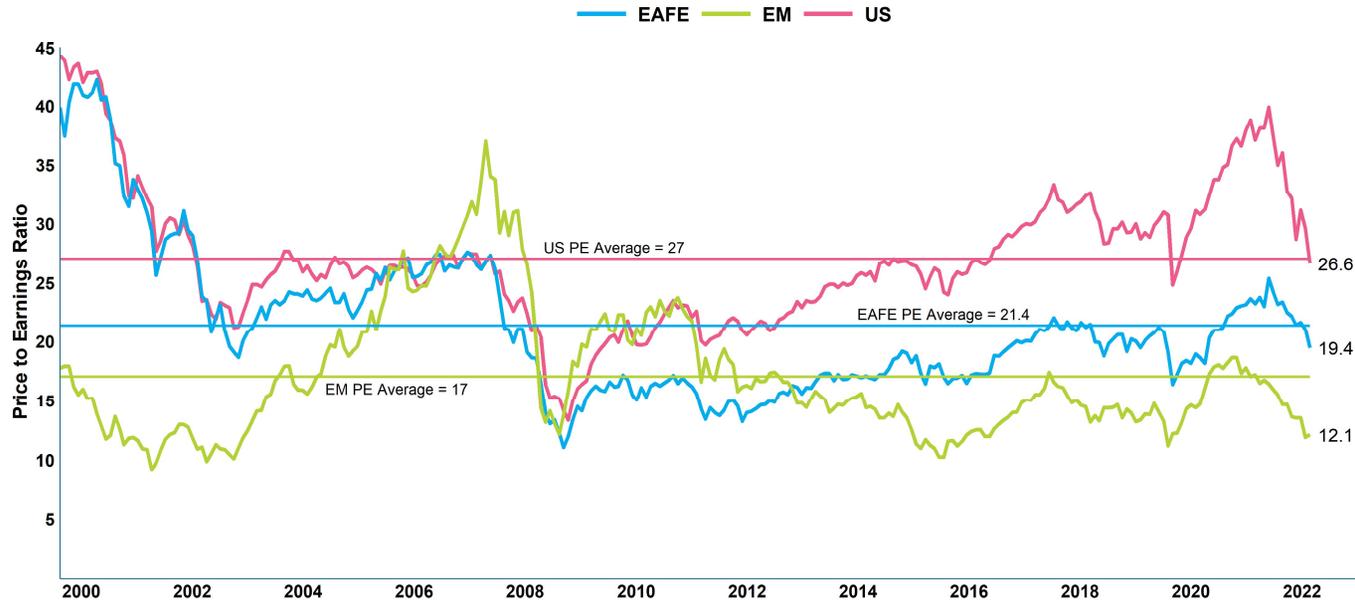
Equity and Fixed Income Volatility¹



- Volatility in equities (VIX) and fixed income (MOVE) rose in September and finished higher overall for the quarter as the Federal Reserve and other central banks made it clear that they were committed to aggressively tightening monetary policy to fight high inflation.
- Fixed income volatility remains particularly high due to the uncertain path of short-term interest rates given stubbornly high inflation. Issues related to the UK's announcement to offer tax breaks despite the central bank's efforts to fight inflation also contributed to volatility in fixed income markets.

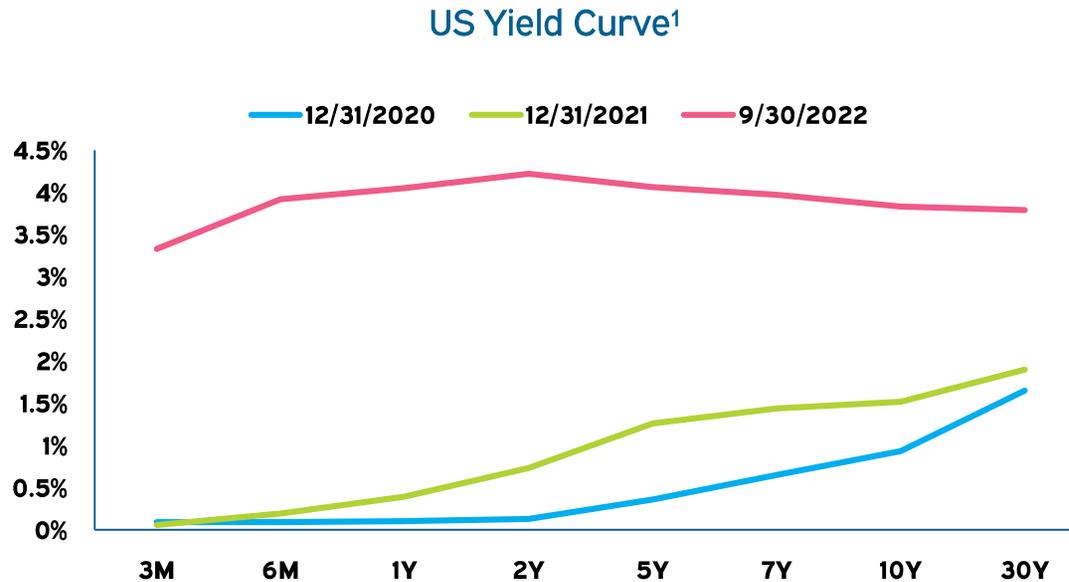
¹ Equity and Fixed Income Volatility – Source: Bloomberg. Implied volatility as measured using VIX Index for equity markets and the MOVE Index to measure interest rate volatility for fixed income markets. Data is as of September 2022. The average line indicated is the average of the VIX and MOVE values between January 2000 and the recent month-end respectively.

Equity Cyclically Adjusted P/E Ratios¹



- September price declines brought US equity price-to-earnings ratios slightly below the long-term (21st Century) average.
- International developed market valuations remain below the US and are below their own long-term average, with those for emerging markets the lowest and well under the long-term average.

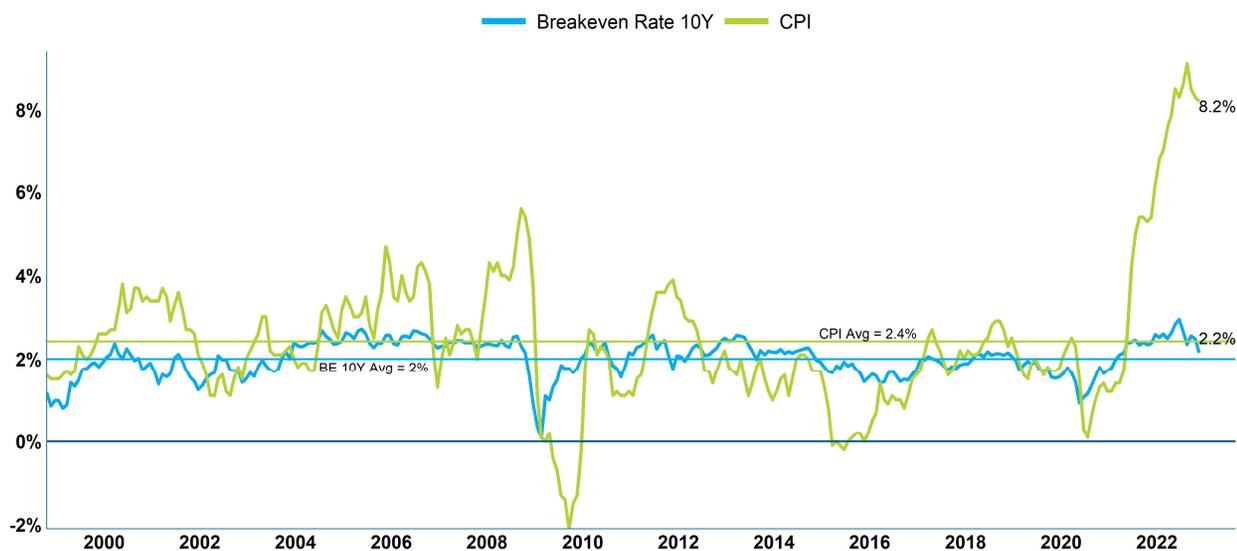
¹ US Equity Cyclically Adjusted P/E on S&P 500 Index. Source: Robert Shiller, Yale University, and Meketa Investment Group. Developed and Emerging Market Equity (MSCI EAFE and EM Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years. Data is as of September 30, 2022. The average line is the long-term average of the US, EM, and EAFE PE values from December 1999 to the recent month-end respectively.



- Rates across the yield curve remain far higher than at the start of the year.
- In September, rates rose across the yield curve, finishing the quarter significantly higher. Yields on two-year Treasuries increased 0.79% just in the month of September bringing the quarterly increase to 1.32%, while ten-year Treasuries rose 0.64% for the month and 0.82% for the quarter.
- The Fed remains strongly committed to fighting inflation, as it increased rates another 75 basis points to a range of 3.0% and 3.25%. This was the fifth increase this year and the third consecutive increase of this amount.
- The yield spread between two-year and ten-year Treasuries remained negative, finishing September at -0.44%. Inversions in the yield curve have historically often preceded recessions.

¹ Source: Bloomberg. Data is as of September 30, 2022.

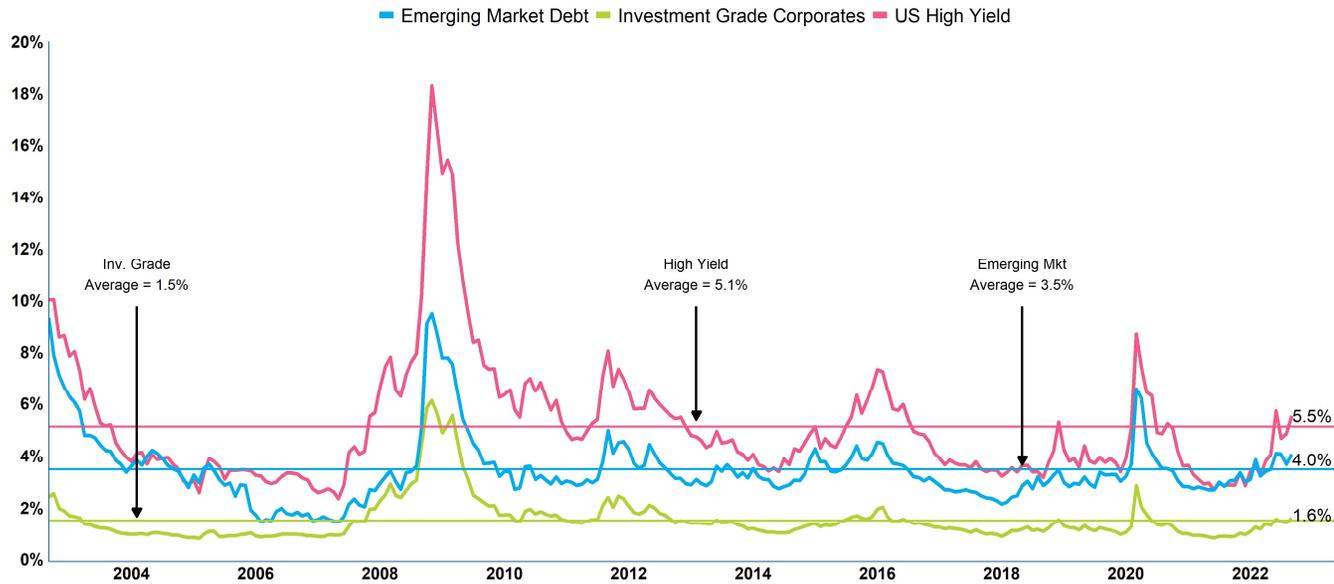
Ten-Year Breakeven Inflation and CPI¹



- Inflation expectations (breakevens) declined for the month and finished the quarter slightly below the long-run average on the belief that tighter monetary policy would lower long-run inflation.
- Trailing twelve-month CPI declined in September (8.2% versus 8.3%) but surprised markets by coming in above expectations.
- Over the last year rising prices for energy (particularly oil), food, housing, and for new and used cars remain key drivers of inflation.

¹ Source: Bloomberg. Data is as of September 30, 2022. The CPI and 10 Year Breakeven average lines denote the average values from August 1998 to the present month-end respectively. Breakeven values represent month-end values for comparative purposes.

Credit Spreads vs. US Treasury Bonds¹



- Credit spreads (the spread above a comparable maturity Treasury) widened in September, finishing the quarter above long-term averages. Fears related to the impact of tighter monetary policy on economic growth was a key driver of wider spreads.
- In the US, spreads for high yield increased sharply (5.5% versus 4.8%), with investment grade spreads rising more modestly (1.6% versus 1.4%). Emerging market spreads also increased (4.0% versus 3.6%).

¹ Sources: Bloomberg. Data is as of September 30, 2022. Average lines denote the average of the investment grade, high yield, and emerging market spread values from August 2000 to the recent month-end respectively.

Global Economic Outlook

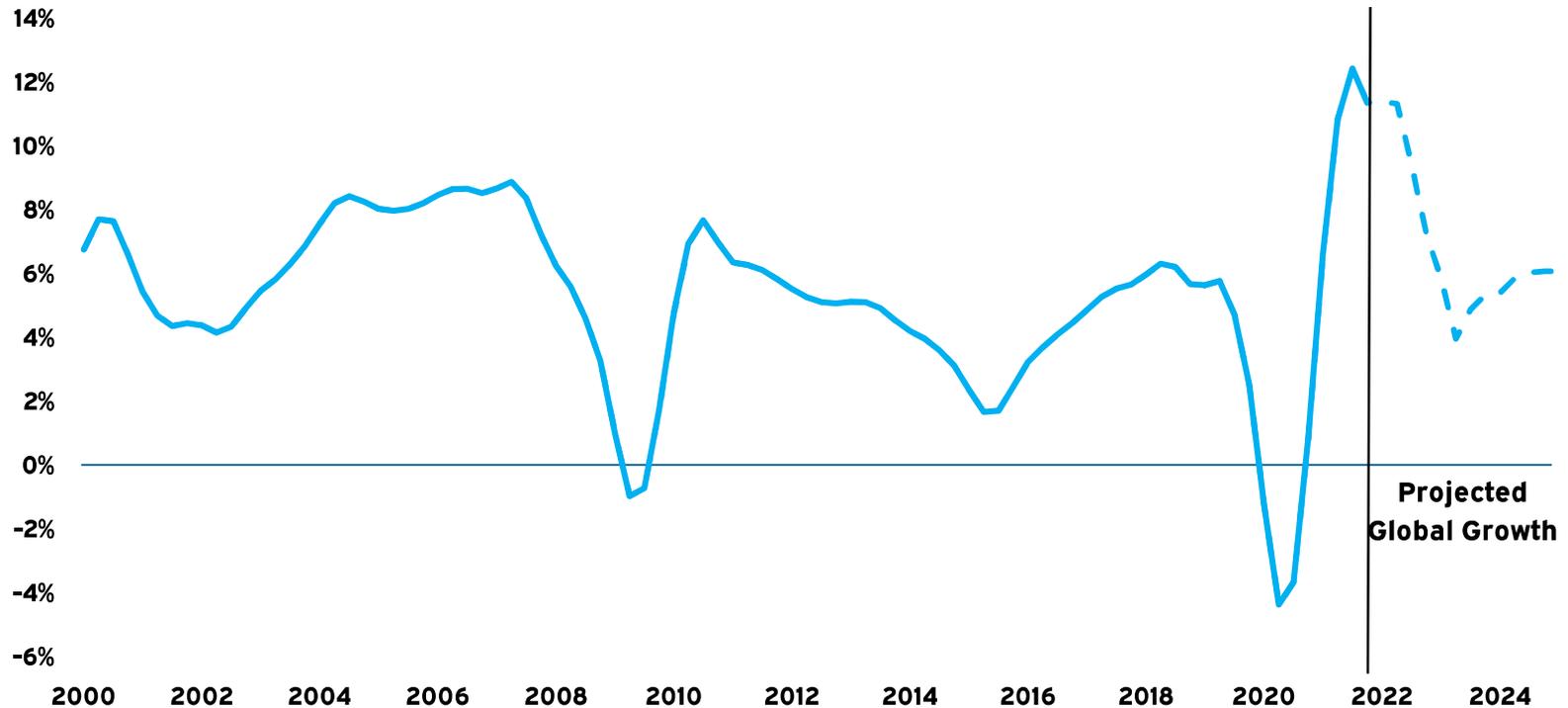
In their October update, the IMF maintained lowered global growth forecasts, driven by the economic impacts of persistent inflation and corresponding tighter policy, as well as issues related to the war in Ukraine and the lingering pandemic.

- The IMF forecasts global GDP growth to come in at 3.2% in 2022 (like the July estimate) and 2.7% in 2023 (0.2% below the prior estimate).
- In advanced economies, GDP is projected to grow 2.4% in 2022 and 1.1% in 2023. The US saw another downgrade in the 2022 (1.6% versus 2.3%) forecast largely due to accelerated policy tightening, given persistently high inflation. The euro area saw an upgrade in expected growth (3.1% versus 2.6%) on substantial fiscal stimulus in 2022 but a downgrade in 2023 (0.5% versus 1.2%) as rising energy prices weigh on the region that is a net importer of energy. The Japanese economy is expected to grow 1.7% this year and 1.6% in 2023.
- Growth projections for emerging markets are higher than developed markets, at 3.7% in 2022 and 2023. China's growth was downgraded for 2022 (3.2% versus 3.3%) and 2023 (4.4% versus 4.6%) given tight COVID-19 restrictions and continued property sector problems.
- The global inflation forecast was significantly increased for 2022 (8.8% versus 7.4%).

	Real GDP (%) ¹			Inflation (%) ¹		
	IMF 2022 Forecast	IMF 2023 Forecast	Actual 10 Year Average	IMF 2022 Forecast	IMF 2023 Forecast	Actual 10 Year Average
World	3.2	2.7	3.2	8.8	6.5	3.6
Advanced Economies	2.4	1.1	1.6	7.2	4.3	1.6
US	1.6	1.0	2.1	8.1	3.5	2.0
Euro Area	3.1	0.5	1.0	8.3	5.7	1.3
Japan	1.7	1.6	0.8	2.0	1.4	0.4
Emerging Economies	3.7	3.7	4.4	9.9	8.1	5.3
China	3.2	4.4	7.3	2.2	2.2	2.4

¹ Source: IMF World Economic Outlook, Real GDP and Inflation forecasts from October 2022 Update. "Actual 10 Year Average" represents data from 2012 to 2021.

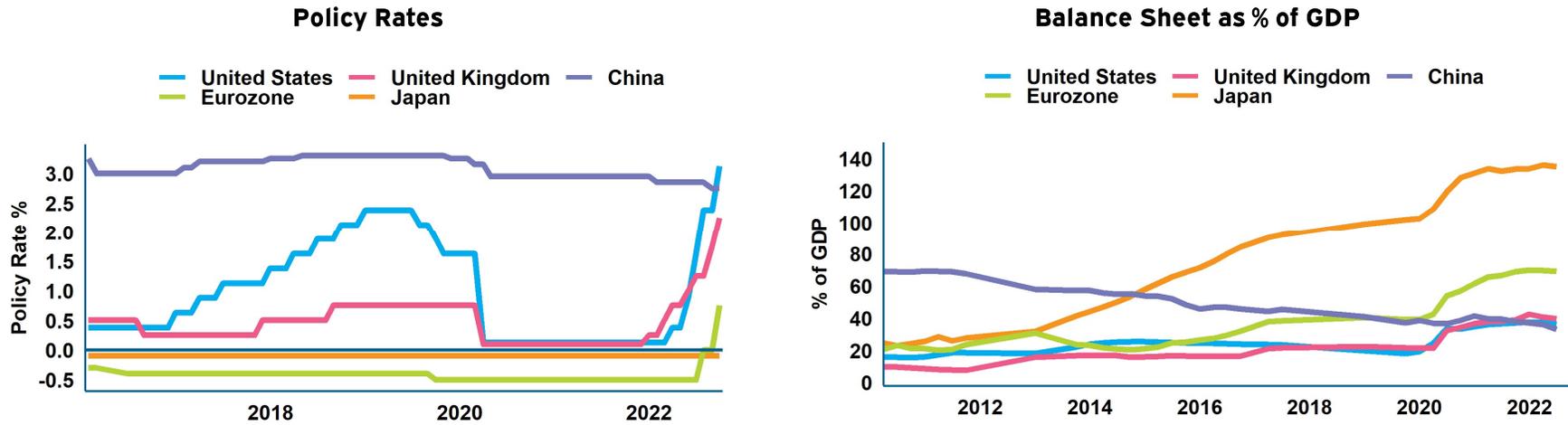
Global Nominal Gross Domestic Product (GDP) Growth¹



- Global economies are expected to slow in 2022 compared to 2021, with risks of recession increasing given persistently high inflation and related tighter monetary policy.
- The delicate balancing act of central banks trying to reduce inflation without dramatically impacting growth will remain key.

¹ Source: Oxford Economics (World GDP, US\$ prices & PPP exchange rate, nominal, % change YoY). Updated September 2022. Nominal expectations for GDP remain much higher than real GDP expectations given the elevated inflation levels.

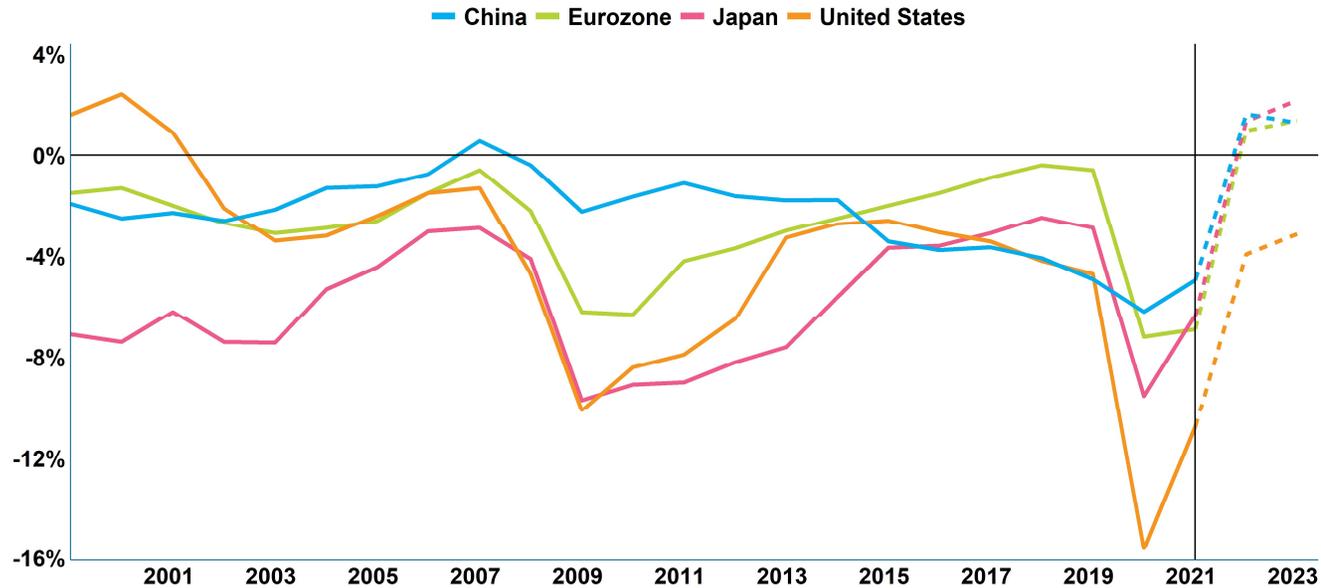
Central Bank Response¹



- After global central banks took extraordinary action to support economies during the pandemic, including policy rate cuts and emergency stimulus through quantitative easing (QE), many are now aggressively reducing support in the face of high inflation.
- The pace of withdrawing support varies across central banks with the US taking a more aggressive approach. The UK is also aggressively increasing rates, but recent talks of easing fiscal policy (this ultimately did not happen) created significant volatility that spilled over into other markets.
- The one notable central bank outlier is China, where the central bank has lowered rates and reserve requirements in response to slowing growth.
- The risk remains for a policy error, particularly overtightening, as record inflation, the war in Ukraine, and a tough COVID-19 policy in China could suppress global growth.

¹ Source: Bloomberg. Policy rate data is as of September 30, 2022. China policy rate is defined as the medium-term lending facility 1 year interest rate. Balance sheet as % of GDP is based on quarterly data and is as of June 30, 2022.

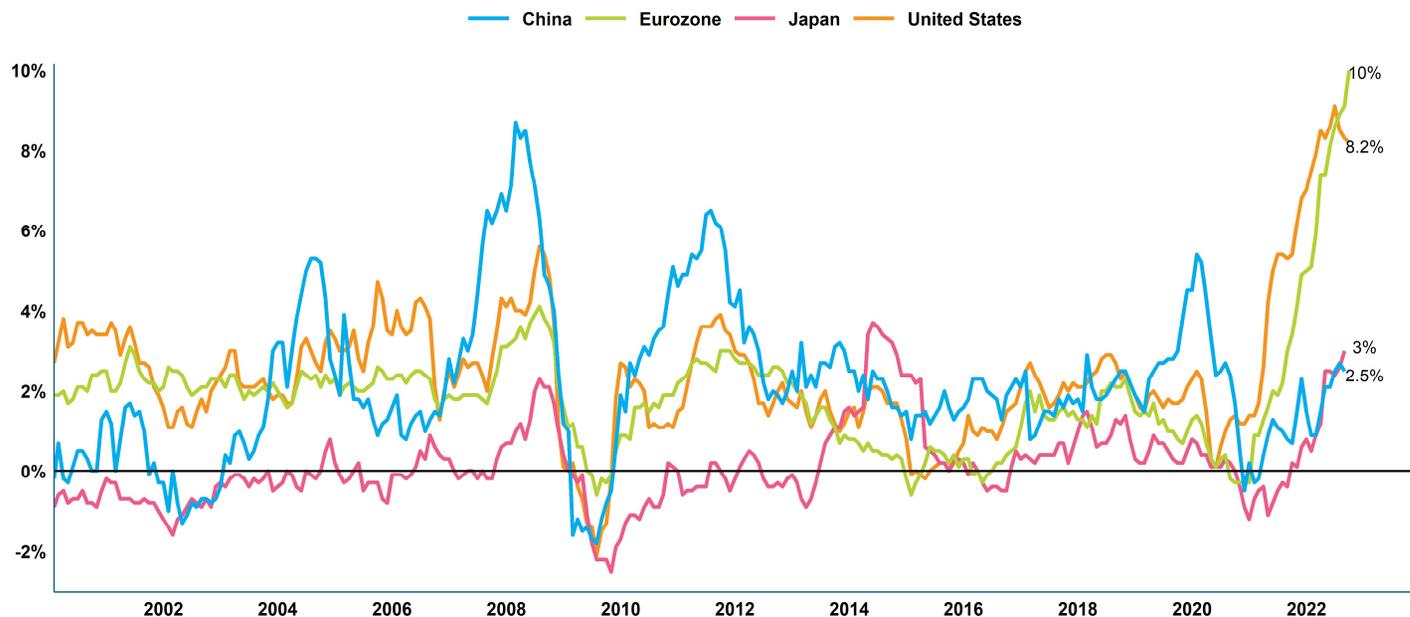
Budget Surplus / Deficit as a Percentage of GDP¹



- Budget deficits as a percentage of GDP drastically increased for major world economies, particularly the US, due to massive fiscal support and the severe economic contraction’s effect on tax revenue in 2020 and 2021.
- As fiscal stimulus programs end, and economic recoveries continue, deficits should improve.
- Questions remain about how some countries will respond fiscally as inflation, particularly energy prices, weigh on consumers. Policies that undermine central banks’ efforts to fight inflation could lead to additional market volatility like was seen in the UK.

¹ Source: Bloomberg. Data is as of September 30, 2022. Projections via IMF Forecasts from October 2022 Report. Dotted lines represent 2022 and 2023 forecasts.

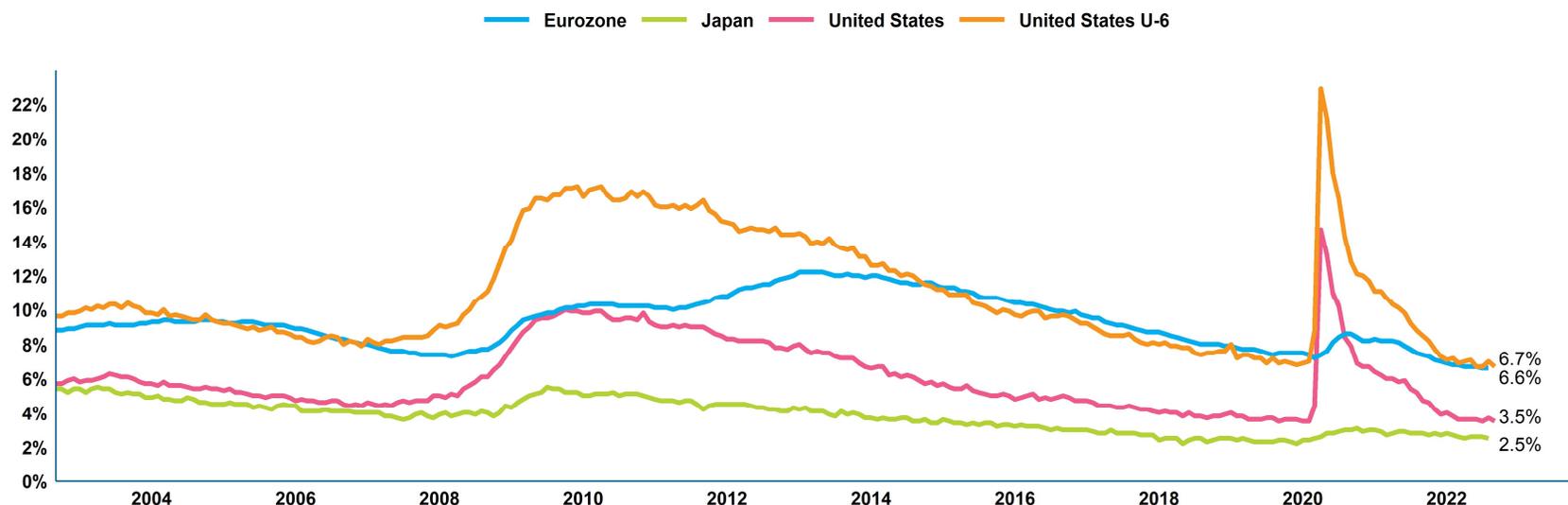
Inflation (CPI Trailing Twelve Months)¹



- Inflation increased dramatically from the lows of the pandemic, particularly in the US and Eurozone where it has reached levels not seen in many decades.
- Supply issues related to the pandemic, record monetary and fiscal stimulus, strict COVID-19 restrictions in China, and higher prices in many commodities driven by the war in Ukraine have been key global drivers of inflation.

¹ Source: Bloomberg. Data is as of September 2022. The most recent data for Japan and China is as of August 31, 2022.

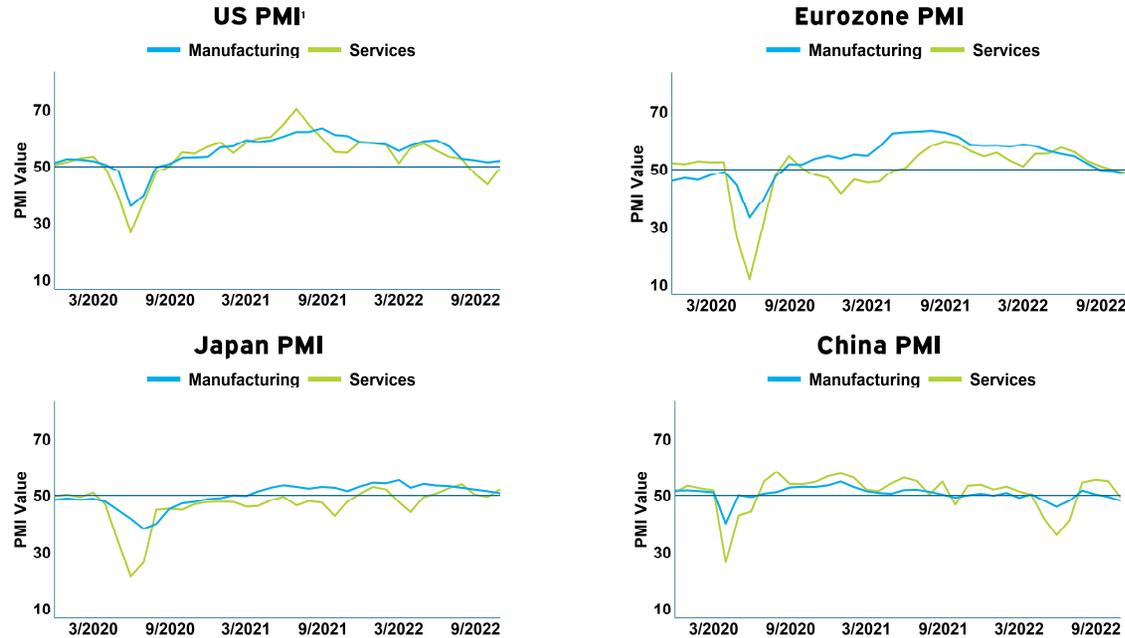
Unemployment¹



- As economies have largely reopened, helped by vaccines for the virus, improvements have been seen in the labor market.
- Despite slowing growth and high inflation the US labor market remains a bright spot. Unemployment in the US, which experienced the steepest rise from the pandemic, declined to pre-pandemic (3.5%) levels. The broader measure (U-6) that includes discouraged and underemployed workers declined but is much higher at 6.7%.
- The strong labor market and higher wages, although beneficial for workers, motivates the Fed's efforts to fight inflation, likely leading to eventually higher unemployment.

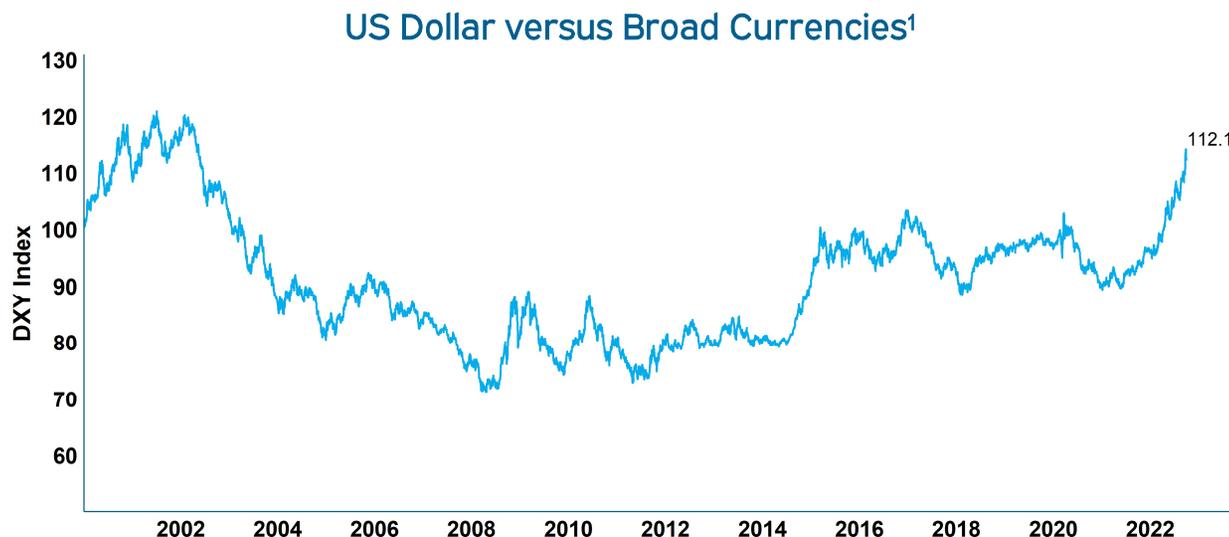
¹ Source: Bloomberg. Data is as of September 2022, for the US. The most recent data for Eurozone and Japanese unemployment is as of August 31, 2022.

Global PMIs



- After improvements from the lows of the pandemic, Purchasing Managers Indices (PMI), based on surveys of private sector companies, have largely experienced downward pressure recently.
- Service sector PMIs, except Japan, are all in contraction territory. The US service sector recovered somewhat but remains in negative territory due to weak demand, a sharp decline in new orders, and softening employment.
- Manufacturing PMIs are also slowing across China and developed markets given declines in demand and inflationary pressures with the Eurozone and China in contraction territory.

¹ Source: Bloomberg. US Markit Services and Manufacturing PMI, Caixin Services and Manufacturing PMI, Eurozone Markit Services and Manufacturing PMI, Jibun Bank Services and Manufacturing PMI. Data is as of September 2022. Readings below 50 represent economic contractions.



- The US dollar continued to strengthen in September, increasing 7.1% overall for the quarter and reaching levels not seen in two decades.
- The increased pace of policy tightening, stronger relative growth, and safe-haven flows all contributed to the dollar’s strength this year.
- The euro, yen, pound, and yuan have all experienced significant declines versus the dollar this year, adding to inflation.

¹ Source: Bloomberg. Data as of September 30, 2022.

Summary

Key Trends in 2022:

- The impacts of record high inflation will remain key, with market volatility likely to remain high.
- The pace of monetary tightening globally will be faster than previously expected, with the risk of overtightening.
- Expect growth to slow globally in 2022 and into 2023 to the long-term trend or below. Inflation, monetary policy, and the war will all be key.
- In the US the end of many fiscal programs is expected to put the burden of continued growth on consumers. Higher energy and food prices will depress consumers' spending in other areas.
- Valuations have significantly declined in the US to below long-term averages.
- Outside the US, equity valuations remain lower in both emerging and developed markets, but major risks remain, including continued strength in the US dollar, higher inflation particularly weighing on Europe, and China maintaining its restrictive COVID-19 policies.

Executive Summary

Q3 2022

OPERF Performance Summary – Commentary

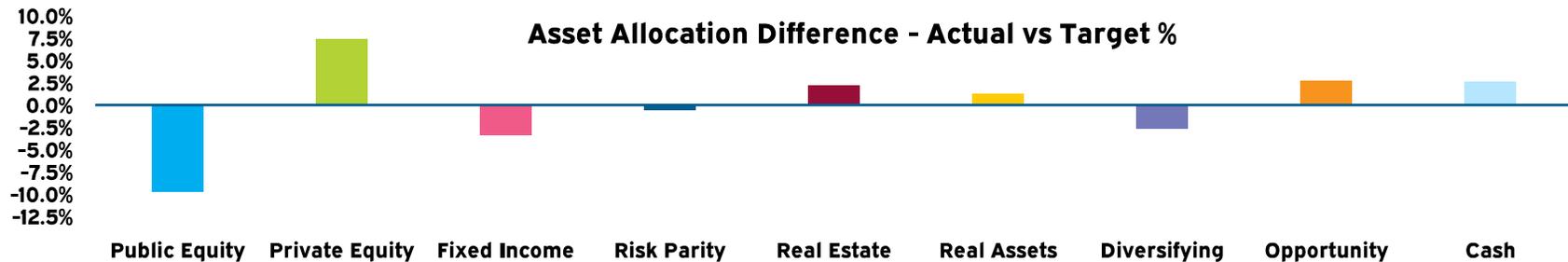
- Both equity and fixed income markets saw significant negative returns in light of economic concerns and uncertainty around the ability of the Fed to combat inflation through rate hikes without spurring a recession.
- In spite of this negative backdrop, several of the factors that have been a drag on the OPERF portfolio over the last several years have been a tailwind to relative performance in 2022. These include the value bias, as well as the exposure to global low volatility strategies. Each of these areas contributed meaningfully to relative outperformance.
- OPERF posted a return of -3.1% for the third quarter, relative to a benchmark return of -5.8% and peer median return of -3.8%. Year to date performance of -4.4% was well ahead of the benchmark return of -11.2%.
- Performance for the quarter ranks in the top quartile of the InvestMetrics public plan peer universe of all DB plans over \$10 billion, with longer-term performance over all time periods shown ranking in the top decile.
- By far the most meaningful contributor to absolute performance for the Quarter and year to date period was the Real Assets Portfolio, producing a 15.6% positive return in 2022 thus far.
- On a relative basis, private equity returns, which were well ahead of their Russell 3000 +300 benchmark, helped produced benchmark-relative outperformance. Note that the lag in valuations here contributes positively, and a future pullback in these returns is expected.
- The OPERF Portfolio maintains a significant overweight relative to the target in private equity - actual allocation of 27.4% versus a target allocation of 20%.

OPERF Performance Summary – Commentary (continued)

- Public Equities (-7.3%) underperformed the broad MSCI ACWI IMI Net (Daily) index (-6.6%). Underperformance was driven by the Market Oriented portfolios, in the US and International space, both of which underperformed their benchmarks in the period.
- OPERF's Fixed Income portfolio (-3.7%) outperformed the Oregon Custom Core FI Benchmark (-4.8%). Core Fixed Income continues to face challenges in the rising rate environment. Outperformance in the third quarter was driven by higher yielding Non-Core Fixed Income (+0.9%) and the Global Sovereign Portfolio (-2.3%).
- Real Estate, while lagging its NCREIF ODCE benchmark for the quarter, delivered positive absolute returns (+3.1%). OPERF's 14.7% allocation served as an additional tailwind. Longer-term results have contributed positively to OPERF with the asset class returning low double digit returns over the 1-, 3-, 5-, and 10-year periods.
- Overall, the OPERF portfolio remains diversified, and the Asset Liability Study currently underway highlights areas for continued refinement from an allocation standpoint, while the asset class reviews highlight specific implementation goals designed to create a robust portfolio into the future.

OPERF Asset Allocation as of September 30, 2022

Asset Class	Actual (\$ 000)	Actual Weight (%)	Target Weight (%)	Difference (%)	Difference (\$ 000)
Public Equity	18,251,940	20.3	30.0	-9.7	-8,678,302
Private Equity	24,603,467	27.4	20.0	7.4	6,649,973
Fixed Income	14,958,454	16.7	20.0	-3.3	-2,995,040
Risk Parity	1,734,364	1.9	2.5	-0.6	-509,823
Real Estate	13,225,303	14.7	12.5	2.2	2,004,369
Real Assets	7,878,995	8.8	7.5	1.3	1,146,434
Diversifying	4,331,700	4.8	7.5	-2.7	-2,400,860
Opportunity	2,449,510	2.7	0.0	2.7	2,449,510
Cash	2,333,740	2.6	0.0	2.6	2,333,740
Total	89,767,472	100.0	100.0		
YTD Net Cash Flow	-2,607,608				
Gain/Loss¹	-4,161,317				



- A significant majority of OPERF’s assets are allocated to risk-oriented assets in the public and private equity markets.
- Discussions continue regarding the overweight to Private Equity. It is important to note that reducing exposure to PE is challenging given the nature of the asset class, and a work in progress.

¹ Gain/Loss includes Income.

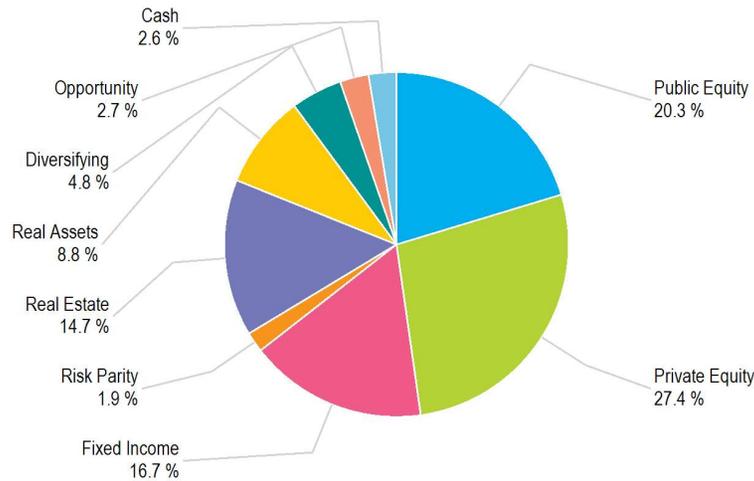
OPERF Q3 2022 Performance Attribution

	QTD	1 Yr	3 Yr	5 Yr	10 Yr
Total Fund	-3.1	-0.6	8.5	7.9	8.5
Total Fund ex Overlay	-3.1	-0.8	8.7	7.9	8.5
<i>OPERF Policy Benchmark</i>	-5.8	-8.4	6.3	6.7	8.2
Over/Under	2.7	7.8	2.2	1.2	0.3
InvMetrics All DB > \$10B Net Median	-3.8	-9.3	5.4	6.0	7.2
InvMetrics All DB > \$10B Net Rank	16	1	1	3	4
Total Fixed Income	-3.7	-12.5	-2.2	0.4	1.5
<i>Oregon Custom FI Benchmark</i>	-4.8	-14.6	-3.1	-0.2	0.9
Over/Under	1.1	2.1	0.9	0.6	0.6
Total Public Equity	-7.3	-18.9	4.0	4.3	7.8
<i>MSCI ACWI IMI Net (Daily)</i>	-6.6	-21.2	3.6	4.2	7.3
Over/Under	-0.7	2.3	0.4	0.1	0.5
Total Real Estate	3.1	29.2	13.8	11.4	11.4
<i>NCREIF ODCE (Custom) (Adj.)</i>	4.5	28.3	11.7	9.6	10.0
Over/Under	-1.4	0.9	2.1	1.8	1.4
Risk Parity	-8.1	-22.2	--	--	--
<i>S&P Risk Parity - 12% Target Volatility</i>	-12.4	-20.0	2.1	5.3	5.8
Over/Under	4.3	-2.2			
Opportunity Portfolio	-2.7	3.4	11.5	8.9	8.9
<i>CPI + 5%</i>	1.4	13.6	10.2	8.9	7.6
Over/Under	-4.1	-10.2	1.3	0.0	1.3
Diversifying Strategies	1.1	18.0	2.5	0.3	2.8
<i>HFRI FOF Conservative Index</i>	0.2	-0.7	4.7	3.8	3.7
Over/Under	0.9	18.7	-2.2	-3.5	-0.9
Real Assets	1.8	20.4	10.9	7.5	--
<i>CPI + 4%</i>	1.2	12.2	9.0	7.8	6.6
Over/Under	0.6	8.2	1.9	-0.3	
Private Equity	-4.9	5.2	18.2	17.4	14.8
<i>Russell 3000 + 300 BPS QTR LAG (Adj.)</i>	-16.0	-11.2	13.0	13.9	15.9
Over/Under	11.1	16.4	5.2	3.5	-1.1
Cash	0.2	-0.6	0.6	1.3	1.1
<i>ICE BofA US 3-Month Treasury Bill</i>	0.5	0.6	0.6	1.1	0.7
Over/Under	-0.3	-1.2	0.0	0.2	0.4

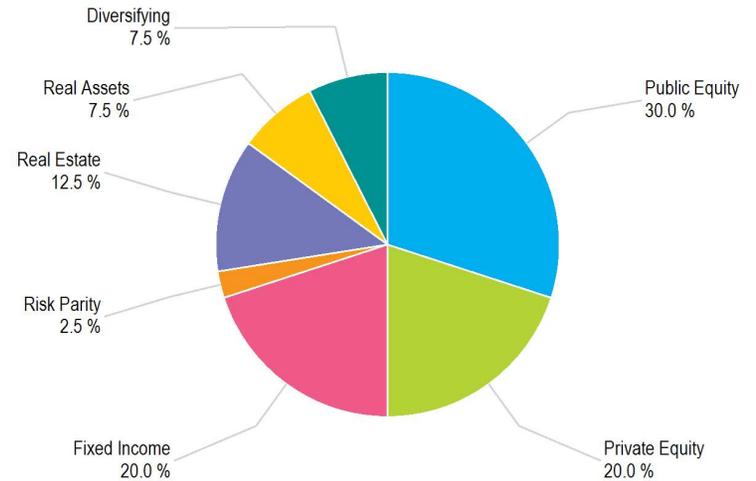
Target	Overweight / Underweight	Contributors / Detractors
Policy	As of 9/30/22	QTD
20.0%	-3.4%	Contributor
30.0%	-8.1%	Contributor
12.5%	1.1%	Detractor
2.5%	-0.5%	Contributor
0.0%	2.6%	Detractor
7.5%	-2.6%	Neutral
7.5%	0.4%	Neutral
20.0%	8.0%	Contributor
0.0%	2.5%	Neutral

Performance Update
as of September 30, 2022

Actual Asset Allocation



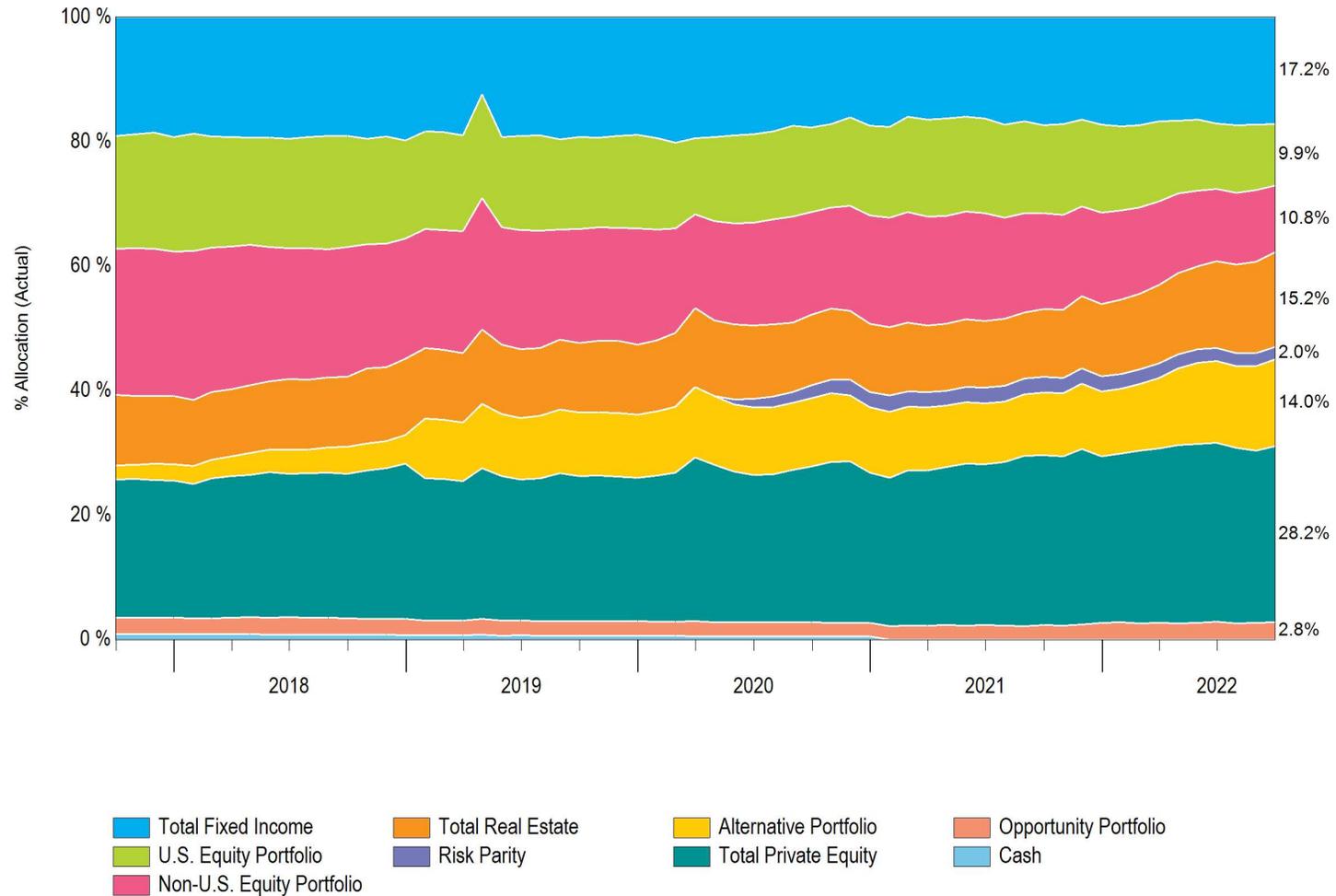
Target Asset Allocation



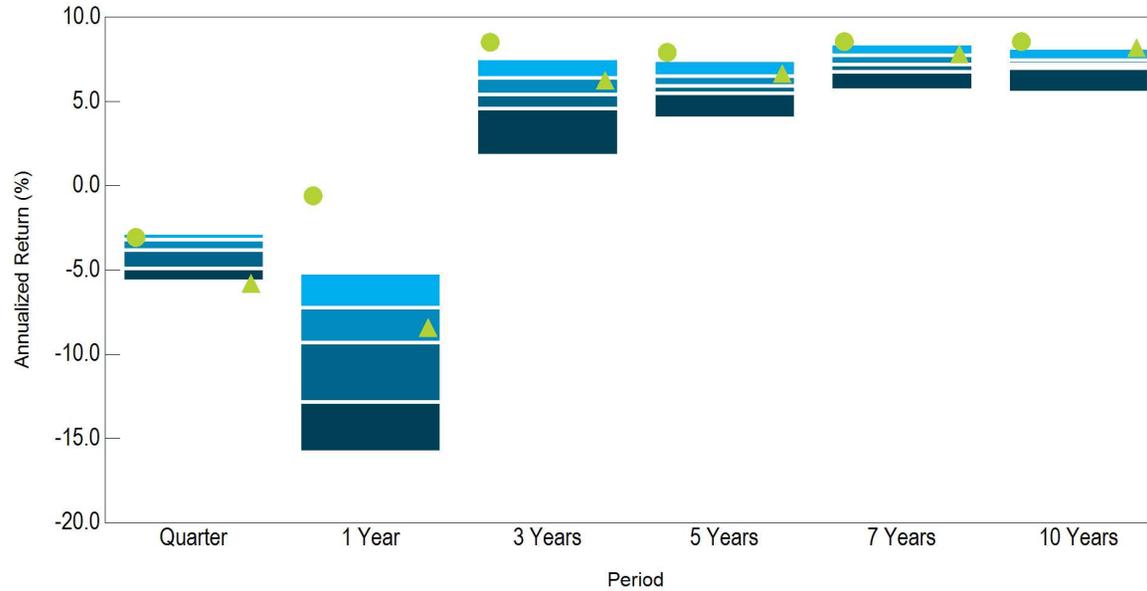
Asset Allocation vs. Target
As Of September 30, 2022

	Current	Current	Policy	Difference	Difference
Public Equity	\$18,251,939,643	20.3%	30.0%	-9.7%	-\$8,678,302,072
Private Equity	\$24,603,467,115	27.4%	20.0%	7.4%	\$6,649,972,638
Fixed Income	\$14,958,454,325	16.7%	20.0%	-3.3%	-\$2,995,040,152
Risk Parity	\$1,734,363,793	1.9%	2.5%	-0.6%	-\$509,823,017
Real Estate	\$13,225,303,294	14.7%	12.5%	2.2%	\$2,004,369,246
Real Assets	\$7,878,994,612	8.8%	7.5%	1.3%	\$1,146,434,183
Diversifying	\$4,331,700,244	4.8%	7.5%	-2.7%	-\$2,400,860,184
Opportunity	\$2,449,509,690	2.7%	0.0%	2.7%	\$2,449,509,690
Cash	\$2,333,739,667	2.6%	0.0%	2.6%	\$2,333,739,667
Total	\$89,767,472,384	100.0%	100.0%		

Asset Allocation History
5 Years Ending September 30, 2022

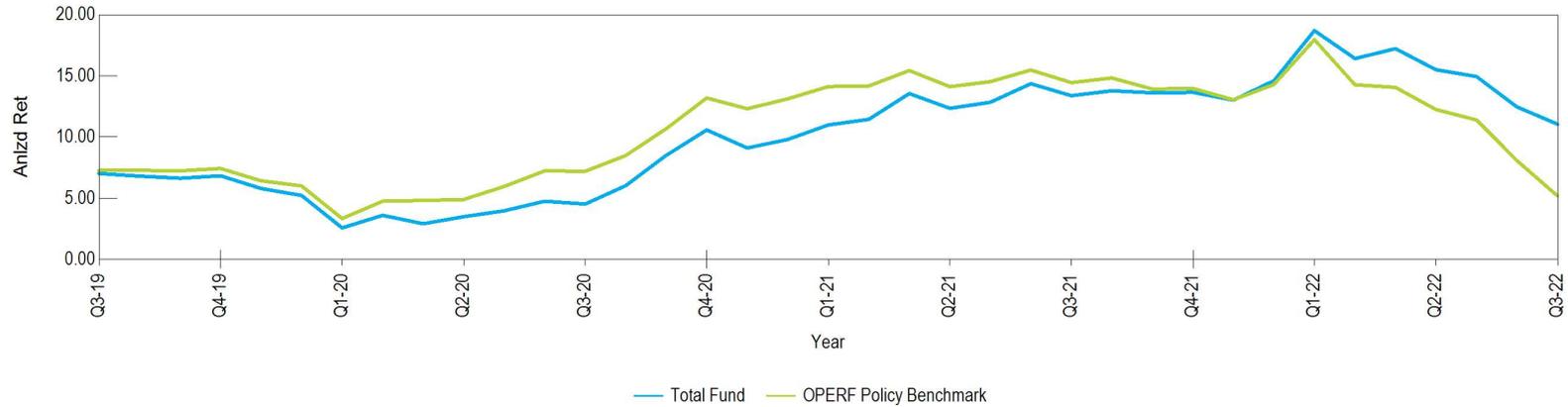


InvMetrics All DB > \$10B Net Return Comparison Ending September 30, 2022

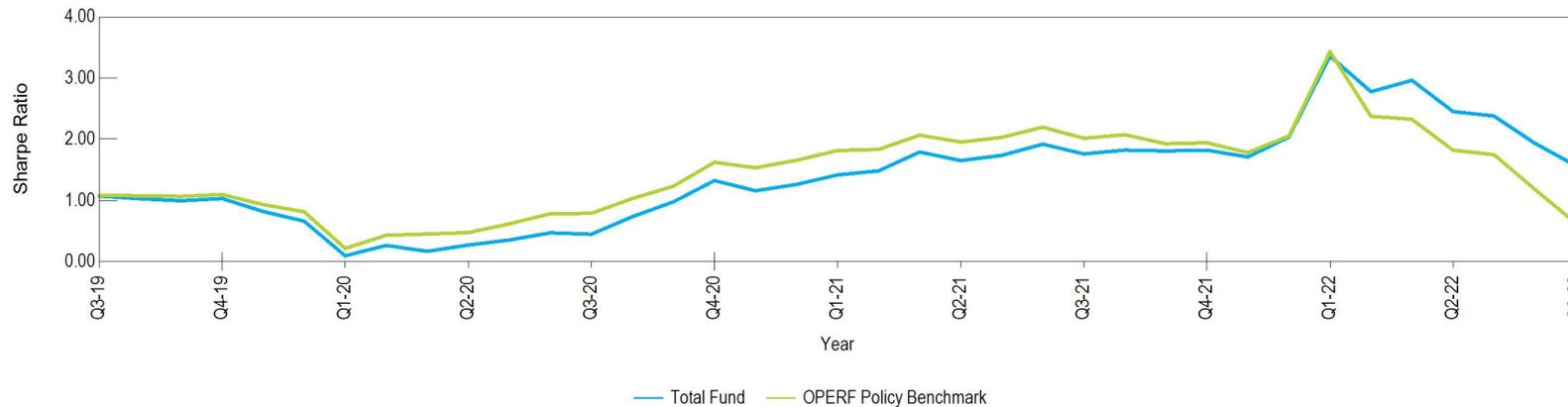


	Quarter		1 Year		3 Years		5 Years		7 Years		10 Years	
5th Percentile	-2.8	-5.2	7.5	7.4	8.4	8.2						
25th Percentile	-3.2	-7.2	6.4	6.5	7.8	7.5						
Median	-3.8	-9.3	5.4	6.0	7.2	7.2						
75th Percentile	-4.9	-12.8	4.6	5.5	6.8	7.0						
95th Percentile	-5.7	-15.8	1.8	4.0	5.7	5.6						
# of Portfolios	18	18	18	16	16	15						
● Total Fund	-3.1 (16)	-0.6 (1)	8.5 (1)	7.9 (3)	8.5 (5)	8.5 (4)						
▲ OPERF Policy Benchmark	-5.8 (96)	-8.4 (30)	6.3 (34)	6.7 (18)	7.8 (19)	8.2 (5)						

Rolling 3 Year Annualized Return (%)
Total Fund vs. OPERF Policy Benchmark



Rolling 3 Year Sharpe Ratio
Total Fund vs. OPERF Policy Benchmark



Trailing Net Performance								
	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Total Fund	89,767,472,384	100.0	-3.1	-4.4	-0.6	8.5	7.9	8.5
<i>OPERF Policy Benchmark</i>			-5.8	-11.2	-8.4	6.3	6.7	8.2
<i>60% MSCI ACWI / 40% Bloomberg Aggregate</i>			-5.9	-21.3	-18.1	1.3	2.9	4.9
<i>70% MSCI ACWI/30% Barclays Agg</i>			-6.2	-22.3	-18.7	1.9	3.3	5.5
<i>InvMetrics All DB > \$10B Net Median</i>			-3.8	-13.4	-9.3	5.4	6.0	7.2
<i>InvMetrics All DB > \$10B Net Rank</i>			16	1	1	1	3	4
Total Fixed Income	14,958,454,325	16.7	-3.7	-12.6	-12.5	-2.2	0.4	1.5
<i>Oregon Custom FI Benchmark</i>			-4.8	-14.6	-14.6	-3.1	-0.2	0.9
<i>Bloomberg US Aggregate TR</i>			-4.8	-14.6	-14.6	-3.3	-0.3	0.9
<i>Fixed Income Weighted BM</i>			-3.8	-13.1	-12.9	-2.8	0.1	1.1
Core Fixed Income	4,084,087,458	4.5	-4.8	-15.9	-15.7	-3.1	-0.1	1.4
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0
Alliance Bernstein	19,260	0.0	0.1	3.2	11.0	5.5	5.1	3.9
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0
Blackrock	1,183,473,273	1.3	-5.0	-15.2	-15.3	-2.9	0.0	1.2
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0
Wellington	1,208,848,080	1.3	-4.6	-16.0	-15.6	-2.9	0.1	1.6
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0
Western Asset	1,219,855,560	1.4	-4.8	-16.8	-16.6	-3.2	0.1	1.7
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0
Fidelity	471,891,284	0.5	-5.0	--	--	--	--	--
<i>Oregon Custom External FI BM</i>			-4.8	-14.6	-14.6	-3.3	-0.3	1.0

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
U.S. Government	6,456,567,573	7.2	-4.4	-13.0	-12.9	-3.0	-0.2	--
<i>Government Blended Index</i>			-4.3	-13.1	-12.9	-3.1	-0.2	0.2
Government Portfolio	6,456,567,573	7.2	-4.4	-13.0	-12.9	-3.0	-0.2	--
<i>Government Blended Index</i>			-4.3	-13.1	-12.9	-3.1	-0.2	0.2
Non-Core Fixed Income	1,508,409,335	1.7	0.9	-2.4	-1.6	3.2	3.7	4.5
<i>Custom Non-Core Fixed Income Index</i>			0.9	-6.1	-5.5	1.5	2.6	3.6
KKR Asset Management	25,041,858	0.0	1.5	-31.8	-30.5	-6.7	-2.5	1.2
<i>KKR Custom Leveraged Loans & Bond Index</i>			0.7	-7.3	-6.6	1.2	2.5	3.7
Oak Hill	1,483,367,477	1.7	0.9	-1.5	-0.7	3.7	4.2	4.9
<i>Oakhill Custom Lev Loan & Bond Index</i>			1.1	-5.0	-4.3	1.8	2.8	3.6
Global Sovereign	1,052,822,643	1.2	-2.3	-9.7	-9.8	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>			-2.4	-9.9	-9.8	-3.3	0.6	2.2
MSIM Global Sovereign	526,261,437	0.6	-2.3	-9.6	-9.6	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>			-2.4	-9.9	-9.8	-3.3	0.6	2.2
PIMCO Global Sovereign	526,561,206	0.6	-2.4	-9.9	-10.0	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>			-2.4	-9.9	-9.8	-3.3	0.6	2.2
Emerging Markets Debt	286,899,459	0.3	-5.2	-25.8	-26.7	--	--	--
<i>JP Morgan EMBI Global Diversified</i>			-4.6	-23.9	-24.3	-7.2	-2.6	1.1
Ashmore EMD	89,771,319	0.1	-7.3	-28.8	-30.3	--	--	--
<i>JP Morgan EMBI Global Diversified</i>			-4.6	-23.9	-24.3	-7.2	-2.6	1.1
Global Evolution EMD	98,083,408	0.1	-4.7	-24.7	-25.2	--	--	--
<i>JP Morgan EMBI Global Diversified</i>			-4.6	-23.9	-24.3	-7.2	-2.6	1.1
PGIM EMD	99,044,732	0.1	-3.7	-24.1	-24.6	--	--	--
<i>JP Morgan EMBI Global Diversified</i>			-4.6	-23.9	-24.3	-7.2	-2.6	1.1

Total Fund | As of September 30, 2022

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Structured Credit Products	1,569,667,858	1.7	-2.9	-10.3	--	--	--	--
<i>Oregon Structured Credit Products FI BM</i>			-3.2	-10.0	--	--	--	--
Schroders SCP	534,307,882	0.6	-2.2	-8.0	--	--	--	--
<i>ICE BofA AA-BBB US Asset Backed Sec Idx</i>			-2.1	-8.1	-8.5	-0.8	1.2	2.2
Putnam SCP	484,965,642	0.5	-5.1	-16.6	--	--	--	--
<i>Bloomberg US MBS TR USD</i>			-5.3	-13.7	-14.0	-3.7	-0.9	0.5
Guggenheim SCP	550,394,334	0.6	-1.6	-5.7	--	--	--	--
<i>ICE BofA AA-BBB US Asset Backed Sec Idx</i>			-2.1	-8.1	-8.5	-0.8	1.2	2.2
Total Public Equity	18,082,673,077	20.1	-7.3	-23.3	-18.9	4.0	4.3	7.8
<i>MSCI ACWI IMI Net (Daily)</i>			-6.6	-25.7	-21.2	3.6	4.2	7.3
U.S. Equity	8,597,364,312	9.6	-5.2	-23.6	-16.9	6.4	6.9	10.4
<i>Russell 3000 TR</i>			-4.5	-24.6	-17.6	7.7	8.6	11.4
Small Cap Growth	211,393,110	0.2	-2.1	-29.3	-24.9	12.1	8.7	10.9
<i>Russell 2000 Growth TR</i>			0.2	-29.3	-29.3	2.9	3.6	8.8
EAM MicroCap Growth	211,393,110	0.2	-2.1	-29.3	-24.9	12.1	8.7	11.9
<i>Russell Microcap Growth Index (Daily)</i>			2.1	-31.6	-37.1	4.4	0.6	6.6
Small Cap Value	320,256,650	0.4	-4.5	-17.2	-11.7	6.9	3.9	8.6
<i>Russell 2000 Value TR</i>			-4.6	-21.1	-17.7	4.7	2.9	8.0
AQR Capital Management	54,517,966	0.1	-10.0	-17.5	-9.4	5.8	1.3	7.0
<i>Russell 2000 Value TR</i>			-4.6	-21.1	-17.7	4.7	2.9	8.0
Mellon Asset Management	136,813,909	0.2	-3.7	-18.2	-13.1	5.5	5.3	9.1
<i>Russell 2000 Value TR</i>			-4.6	-21.1	-17.7	4.7	2.9	8.0

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
DFA MicroCap Value	128,923,796	0.1	-3.5	-15.2	-9.9	9.9	4.3	--
<i>Russell Microcap Value (Daily)</i>			-2.2	-21.5	-20.5	7.5	4.3	9.3
Callan US Microcap Value	978	0.0	9.7	-7.8	-4.2	11.4	7.0	--
<i>Russell Microcap Value (Daily)</i>			-2.2	-21.5	-20.5	7.5	4.3	9.3
Market Oriented (CORE)	8,065,714,196	9.0	-5.4	-23.9	-17.0	6.6	7.5	10.7
<i>Russell 1000 TR</i>			-4.6	-24.6	-17.2	8.0	9.0	11.6
DFA Large Cap Core	2,027,687,230	2.3	-4.8	-21.4	-14.3	7.2	7.4	--
<i>Russell 1000 TR</i>			-4.6	-24.6	-17.2	8.0	9.0	11.6
Russell 2000 Synthetic - OST managed	266,697,240	0.3	-5.1	-23.2	-18.9	5.7	4.2	9.4
<i>S&P 600 Custom</i>			-5.2	-23.2	-18.8	5.5	4.1	8.9
S&P 500 - OST managed	2,310,282,518	2.6	-4.9	-23.9	-15.5	8.2	9.3	11.7
<i>S&P 500 Index (Daily)</i>			-4.9	-23.9	-15.5	8.2	9.2	11.7
S&P 400 - OST managed	551,606,822	0.6	-2.5	-21.5	-15.3	6.0	5.9	10.2
<i>S&P 400 Midcap Index (Daily)</i>			-2.5	-21.5	-15.2	6.0	5.8	10.0
OST Risk Premia Strategy	2,909,440,384	3.2	-6.6	-26.0	-19.8	5.2	7.4	--
<i>Risk Premia Custom Index</i>			-6.6	-25.9	-19.8	5.2	7.4	--
Non-U.S. Equity	5,903,644,925	6.6	-10.3	-25.5	-23.8	1.4	1.0	4.9
<i>Oregon MSCI ACWI Ex US IMI (Net)</i>			-9.7	-26.9	-25.7	-1.3	-0.8	3.2
Total International Overlay Accounts	168,487,611	0.2						
PERS-Adrian Lee Active Currency	58,000,419	0.1						
PERS-P/E Global Active Currency	66,786,969	0.1						
PERS-Aspect Cap Active Currency	43,699,345	0.0						

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	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
International Market Oriented (Core)	3,498,445,117	3.9	-10.9	-25.0	-22.8	1.3	1.3	5.4
<i>MSCI World ex USA IMI Net Return</i>			-9.2	-27.0	-25.0	-1.2	-0.5	3.8
Arrowstreet Capital	1,106,580,584	1.2	-10.2	-18.5	-15.8	6.5	5.9	9.0
<i>Oregon MSCI ACWI Ex US IMI (Net)</i>			-9.7	-26.9	-25.7	-1.3	-0.8	3.2
Lazard Asset Management	372,545,709	0.4	-9.4	-25.2	-24.9	-2.7	-1.1	3.1
<i>Oregon MSCI ACWI Ex US (Net)</i>			-9.9	-26.5	-25.2	-1.5	-0.8	3.0
Lazard International CEF	731,336,680	0.8	-12.8	-36.7	-35.5	-1.0	-0.2	--
<i>Oregon MSCI ACWI Ex US (Net)</i>			-9.9	-26.5	-25.2	-1.5	-0.8	3.0
AQR Capital Management	252,648,139	0.3	-10.1	-24.7	-23.9	-2.7	-3.5	3.3
<i>Oregon MSCI WORLD Ex US (Net)</i>			-9.2	-26.2	-23.9	-1.2	-0.4	3.6
OST Int'l Risk Premia	1,035,334,005	1.2	-11.1	-21.8	-17.9	1.2	1.6	--
<i>MSCI World x US Custom Div Multiple-Factor</i>			-11.1	-22.0	-18.2	0.8	1.3	--
<i>MSCI World ex USA Net Index</i>			-9.2	-26.2	-23.9	-1.2	-0.4	3.6
International Value	753,356,376	0.8	-10.2	-23.5	-21.7	1.0	0.3	4.9
<i>Oregon MSCI ACWI Ex US Value IMI (Net)</i>			-10.2	-21.6	-20.7	-1.9	-2.0	2.2
Acadian Asset Management	403,113,000	0.4	-8.0	-23.7	-20.4	4.0	2.0	6.1
<i>Oregon MSCI ACWI Ex US Value IMI (Net)</i>			-10.2	-21.6	-20.7	-1.9	-2.0	2.2
Brandes Investment Partners	350,243,376	0.4	-12.7	-23.3	-23.1	-2.0	-1.4	3.7
<i>Oregon MSCI ACWI Ex US Value (Net)</i>			-10.4	-21.0	-20.0	-2.1	-2.1	1.9
International Growth	452,907,144	0.5	-9.1	-31.2	-27.9	0.4	3.2	5.8
<i>Oregon MSCI WORLD Ex US (Net)</i>			-9.2	-26.2	-23.9	-1.2	-0.4	3.6
Walter Scott Management	452,907,144	0.5	-9.1	-31.2	-27.9	0.4	3.2	5.8
<i>Oregon MSCI WORLD Ex US (Net)</i>			-9.2	-26.2	-23.9	-1.2	-0.4	3.6

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
International Small Cap	470,232,594	0.5	-8.8	-27.6	-26.5	1.4	-1.7	5.0
<i>MSCI World Ex US Small Cap Value (Net)</i>			-10.1	-26.4	-25.8	-1.6	-2.0	4.4
DFA International Small Cap	116,357,724	0.1	-9.2	-22.9	-21.8	0.6	-2.5	4.9
<i>MSCI World Ex US Small Cap Value (Net)</i>			-10.1	-26.4	-25.8	-1.6	-2.0	4.4
Harris Associates	132,683,756	0.1	-10.3	-31.8	-31.3	-1.1	-2.4	4.7
<i>MSCI ACWI ex USA Small Cap Value (Net)</i>			-8.8	-24.8	-24.4	-0.1	-1.3	4.2
EAM International Micro Cap	122,527,504	0.1	-6.7	-30.4	-28.0	7.5	-0.3	--
<i>Oregon FTSE Global Ex US Micro Cap</i>			-8.6	-28.5	-27.1	5.9	1.6	--
DFA International Micro Cap	98,663,610	0.1	-8.9	-23.0	-22.7	2.3	-1.5	--
<i>Oregon FTSE Global Ex US Micro Cap</i>			-8.6	-28.5	-27.1	5.9	1.6	--
Emerging Markets	728,703,694	0.8	-9.2	-25.0	-26.1	2.3	0.7	2.9
<i>ORE MSCI Emerging Markets IMI (Net)</i>			-10.8	-26.8	-27.5	-1.2	-1.4	1.3
Genesis Emerging Markets	140,977,956	0.2	-13.2	-31.4	-34.5	-6.0	-2.6	0.9
<i>ORE MSCI Emerging Markets IMI (Net)</i>			-10.8	-26.8	-27.5	-1.2	-1.4	1.3
Arrowstreet Emerging Markets	330,578,080	0.4	-10.1	-22.4	-22.7	7.9	3.2	4.3
<i>ORE MSCI Emerging Markets IMI (Net)</i>			-10.8	-26.8	-27.5	-1.2	-1.4	1.3
Westwood Global Investment	112,480,437	0.1	-6.5	-11.3	-13.2	3.3	1.1	3.4
<i>MSCI Emerging Markets IMI Net</i>			-10.8	-26.8	-27.5	-1.2	-1.5	1.2
William Blair and Company	88,812,542	0.1	-8.2	-34.2	-34.6	2.6	1.0	3.7
<i>MSCI Emerging Markets Growth Net</i>			-12.1	-30.6	-32.1	-1.7	-1.7	1.1
William Blair Emerging Mkt Small Cap	55,785,020	0.1	0.7	-27.5	-27.2	8.0	2.9	--
<i>MSCI Emerging Markets Small Cap Gr Net</i>			-5.6	-28.1	-26.1	6.0	1.2	2.9
OST EM Risk Premia ESG	69,658	0.0						

Total Fund | As of September 30, 2022

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Global Equity	3,581,662,959	4.0	-7.3	-18.4	-14.3	2.3	3.7	8.6
<i>MSCI ACWI IMI Net (Daily)</i>			-6.6	-25.7	-21.2	3.6	4.2	7.3
Alliance Bernstein Global Value	261,827,064	0.3	-10.1	-26.4	-24.4	-0.8	-1.7	5.8
<i>Oregon MSCI ACWI Value (Net)</i>			-7.7	-19.1	-14.0	1.3	1.7	5.4
Global Equity Low Volatility	3,319,835,895	3.7	-7.1	-17.6	-13.3	2.7	4.5	--
<i>MSCI AC World (Daily Const)</i>			-6.8	-25.6	-20.7	3.8	4.4	7.3
<i>MSCI ACWI Minimum Volatility Index (Net)</i>			-6.0	-17.3	-12.1	-0.1	3.9	6.8
LACM Global Equity Low Volatility	790,896,893	0.9	-7.5	-22.3	-17.8	2.9	4.7	--
<i>MSCI AC World (Daily Const)</i>			-6.8	-25.6	-20.7	3.8	4.4	7.3
<i>MSCI ACWI Minimum Volatility Index (Net)</i>			-6.0	-17.3	-12.1	-0.1	3.9	6.8
Arrowstreet Global Low Volatility	862,229,399	1.0	-5.7	-10.5	-8.9	7.4	8.1	--
<i>MSCI ACWI IMI Net (Daily)</i>			-6.6	-25.7	-21.2	3.6	4.2	7.3
AQR Global Low Volatility	549,614,552	0.6	-7.0	-19.9	-15.1	0.3	2.6	--
<i>MSCI AC World (Daily Const)</i>			-6.8	-25.6	-20.7	3.8	4.4	7.3
<i>MSCI ACWI Minimum Volatility Index (Net)</i>			-6.0	-17.3	-12.1	-0.1	3.9	6.8
Acadian Global Low Volatility	625,056,220	0.7	-7.2	-16.6	-10.6	0.1	2.5	--
<i>MSCI ACWI IMI Net (Daily)</i>			-6.6	-25.7	-21.2	3.6	4.2	7.3
DFA Global Low Volatility	492,038,831	0.5	-8.6	-19.5	-14.0	1.7	--	--
<i>MSCI AC World (Daily Const)</i>			-6.8	-25.6	-20.7	3.8	4.4	7.3
Other Equity	779,837	0.0						
Transitional & Closed Accounts	779,834	0.0						
PERS- Equity Distribution	3	0.0						

	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Total Real Estate	13,225,303,294	14.7	3.1	18.7	29.2	13.8	11.4	11.4
<i>NCREIF ODCE (Custom) (Adj.)</i>			4.5	20.6	28.3	11.7	9.6	10.0
Real Estate excluding REITS	12,865,565,268	14.3	3.4	20.3	30.9	14.4	11.8	12.2
<i>NCREIF ODCE (Custom) (Adj.)</i>			4.5	20.6	28.3	11.7	9.6	10.0
Total REITS	359,738,026	0.4	-6.4	-18.5	-10.8	0.0	2.8	4.9
ABKB - LaSalle Advisors	250,193,793	0.3	-8.8	-22.4	-12.0	2.0	8.6	8.8
<i>Nareit Equity Share Price Index</i>			-10.8	-27.9	-16.3	-1.1	4.1	7.0
Woodbourne Investment Management	109,544,233	0.1	-0.6	-7.9	-7.9	1.4	3.2	5.5
<i>Nareit Equity Share Price Index</i>			-10.8	-27.9	-16.3	-1.1	4.1	7.0
Risk Parity	1,734,363,793	1.9	-8.1	-23.8	-22.2	--	--	--
<i>S&P Risk Parity - 12% Target Volatility</i>			-12.4	-23.2	-20.0	2.1	5.3	5.8
Man AHL Target Risk	604,983,598	0.7	-4.3	-20.9	-17.1	--	--	--
<i>S&P Risk Parity - 12% Target Volatility</i>			-12.4	-23.2	-20.0	2.1	5.3	5.8
PanAgora Risk Parity	515,152,395	0.6	-12.0	-31.9	-30.0	--	--	--
<i>S&P Risk Parity - 12% Target Volatility</i>			-12.4	-23.2	-20.0	2.1	5.3	5.8
Bridgewater All Weather	614,227,800	0.7	-8.2	-18.7	-19.6	--	--	--
<i>S&P Risk Parity - 12% Target Volatility</i>			-12.4	-23.2	-20.0	2.1	5.3	5.8
Opportunity Portfolio	2,449,509,690	2.7	-2.7	-0.7	3.4	11.5	8.9	8.9
<i>CPI + 5%</i>			1.4	10.4	13.6	10.2	8.9	7.6
Portfolio Holdings - Opportunity	144,426,917	0.2	-11.3	-26.2	-24.3	-5.6	-28.5	--

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	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Alternative Portfolio	12,210,694,856	13.6	1.5	15.6	19.3	7.2	4.0	4.0
<i>CPI +4%</i>			1.2	9.3	12.2	9.0	7.8	6.6
Diversifying Strategies	4,331,700,244	4.8	1.1	16.2	18.0	2.7	0.2	3.2
Real Assets	7,878,994,612	8.8	1.8	15.6	20.4	10.9	7.5	--
<i>CPI +4%</i>			1.2	9.3	12.2	9.0	7.8	6.6
Infrastructure	5,350,262,535	6.0	0.0	11.6	14.5	12.1	--	--
<i>CPI +4%</i>			1.2	9.3	12.2	9.0	7.8	6.6
Natural Resources	2,528,732,077	2.8	5.8	24.2	33.6	9.7	--	--
<i>CPI +4%</i>			1.2	9.3	12.2	9.0	7.8	6.6
Private Equity	24,603,467,115	27.4	-4.9	1.4	5.2	18.2	17.4	14.8
<i>Russell 3000 + 300 BPS QTR LAG (Adj.)</i>			-16.0	-11.8	-11.2	13.0	13.9	15.9
<i>MSCI ACWI+3% (1 quarter lagged)</i>			-15.0	-12.9	-13.2	9.4	10.2	12.0
Cash	2,013,927,754	2.2	0.2	-0.5	-0.6	0.6	1.3	1.1
<i>ICE BofA US 3-Month Treasury Bill</i>			0.5	0.6	0.6	0.6	1.1	0.7
PERS-Russell Overlay Cash Balance	319,811,914	0.4						

Calendar Year Performance										
	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Total Fund	20.0	7.7	13.6	0.5	15.4	7.1	2.0	7.3	15.6	14.3
<i>OPERF Policy Benchmark</i>	15.6	12.4	14.0	1.2	15.6	9.0	1.6	8.2	15.6	16.6
<i>InvMetrics All DB > \$10B Net Median</i>	16.7	10.7	17.9	-2.6	15.4	8.2	0.3	6.6	14.0	12.8
<i>InvMetrics All DB > \$10B Net Rank</i>	14	94	92	8	51	82	3	34	29	2
Total Fixed Income	-0.9	7.7	8.8	0.3	3.7	2.8	0.6	3.5	1.0	10.4
<i>Oregon Custom FI Benchmark</i>	-0.9	7.3	8.3	0.3	3.3	2.5	0.1	3.0	0.3	8.6
Core Fixed Income	-1.1	8.7	9.8	-0.2	4.6	3.4	0.6	6.9	-1.4	9.1
<i>Oregon Custom External FI BM</i>	-1.5	7.5	8.7	0.0	3.5	2.7	0.6	6.0	-1.9	6.8
Alliance Bernstein	6.3	6.8	8.8	0.2	3.7	3.3	0.4	7.3	-1.8	7.6
<i>Oregon Custom External FI BM</i>	-1.5	7.5	8.7	0.0	3.5	2.7	0.6	6.0	-1.9	6.8
Blackrock	-1.4	9.1	8.9	0.1	3.8	2.8	0.9	6.7	-1.7	7.9
<i>Oregon Custom External FI BM</i>	-1.5	7.5	8.7	0.0	3.5	2.7	0.6	6.0	-1.9	6.8
Wellington	-0.9	9.6	9.8	-0.4	4.6	4.0	0.8	6.5	-1.2	10.0
<i>Oregon Custom External FI BM</i>	-1.5	7.5	8.7	0.0	3.5	2.7	0.6	6.0	-1.9	6.8
Western Asset	-1.2	9.4	11.6	-0.7	5.6	3.7	0.4	7.0	-1.0	11.0
<i>Oregon Custom External FI BM</i>	-1.5	7.5	8.7	0.0	3.5	2.7	0.6	6.0	-1.9	6.8
Fidelity	--	--	--	--	--	--	--	--	--	--
<i>Oregon Custom External FI BM</i>	--	--	--	--	--	--	--	--	--	--
U.S. Government	-2.3	8.1	6.9	0.9	2.3	-1.6	0.9	1.0	--	--
<i>Government Blended Index</i>	-2.3	8.0	6.9	0.9	2.3	-1.3	0.8	0.8	--	--
Government Portfolio	-2.3	8.1	6.9	0.9	--	--	--	--	--	--
<i>Government Blended Index</i>	-2.3	8.0	6.9	0.9	--	--	--	--	--	--

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Non-Core Fixed Income	6.4	3.7	10.5	0.1	4.9	10.1	0.2	2.4	8.1	13.2
<i>Custom Non-Core Fixed Income Index</i>	5.3	3.9	10.1	-0.2	5.0	12.0	-1.7	1.8	5.8	11.1
KKR Asset Management	13.8	2.6	10.5	-0.4	3.4	9.3	-0.2	2.5	9.0	13.8
<i>KKR Custom Leveraged Loans & Bond Index</i>	5.2	4.3	10.6	-0.5	5.3	12.7	-2.1	1.9	6.0	11.7
Oak Hill	5.7	4.9	10.5	0.5	6.3	11.2	0.9	2.2	6.5	12.0
<i>Oakhill Custom Lev Loan & Bond Index</i>	5.2	3.6	9.5	0.0	4.6	11.2	-1.3	1.7	5.6	10.5
Global Sovereign	--	--	--	--	--	--	--	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>	--	--	--	--	--	--	--	--	--	--
MSIM Global Sovereign	--	--	--	--	--	--	--	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>	--	--	--	--	--	--	--	--	--	--
PIMCO Global Sovereign	--	--	--	--	--	--	--	--	--	--
<i>BbgBarc Global Treasury Ex-U.S.</i>	--	--	--	--	--	--	--	--	--	--
Emerging Markets Debt	--	--	--	--	--	--	--	--	--	--
<i>JP Morgan EMBI Global Diversified</i>	--	--	--	--	--	--	--	--	--	--
Ashmore EMD	--	--	--	--	--	--	--	--	--	--
<i>JP Morgan EMBI Global Diversified</i>	--	--	--	--	--	--	--	--	--	--
Global Evolution EMD	--	--	--	--	--	--	--	--	--	--
<i>JP Morgan EMBI Global Diversified</i>	--	--	--	--	--	--	--	--	--	--
PGIM EMD	--	--	--	--	--	--	--	--	--	--
<i>JP Morgan EMBI Global Diversified</i>	--	--	--	--	--	--	--	--	--	--

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Structured Credit Products	--	--	--	--	--	--	--	--	--	--
<i>Oregon Structured Credit Products FI BM</i>	--	--	--	--	--	--	--	--	--	--
Schroders SCP	--	--	--	--	--	--	--	--	--	--
<i>ICE BofA AA-BBB US Asset Backed Sec Idx</i>	--	--	--	--	--	--	--	--	--	--
Putnam SCP	--	--	--	--	--	--	--	--	--	--
<i>Bloomberg US MBS TR USD</i>	--	--	--	--	--	--	--	--	--	--
Guggenheim SCP	--	--	--	--	--	--	--	--	--	--
<i>ICE BofA AA-BBB US Asset Backed Sec Idx</i>	--	--	--	--	--	--	--	--	--	--
Total Public Equity	20.0	12.7	25.3	-10.5	24.5	9.8	-1.7	3.3	26.7	17.5
<i>MSCI ACWI IMI Net (Daily)</i>	<i>18.2</i>	<i>16.3</i>	<i>26.4</i>	<i>-10.1</i>	<i>24.0</i>	<i>8.3</i>	<i>-2.1</i>	<i>3.8</i>	<i>23.5</i>	<i>16.4</i>
U.S. Equity	27.2	13.6	29.0	-7.9	20.3	14.9	-0.8	9.8	35.4	16.3
<i>Russell 3000 TR</i>	<i>25.7</i>	<i>20.9</i>	<i>31.0</i>	<i>-5.3</i>	<i>21.1</i>	<i>12.8</i>	<i>0.5</i>	<i>12.6</i>	<i>33.6</i>	<i>16.4</i>
Small Cap Growth	19.6	38.9	33.9	-4.7	26.8	6.3	-5.0	-3.6	57.9	11.3
<i>Russell 2000 Growth TR</i>	<i>2.8</i>	<i>34.6</i>	<i>28.5</i>	<i>-9.3</i>	<i>22.2</i>	<i>11.3</i>	<i>-1.4</i>	<i>5.6</i>	<i>43.3</i>	<i>14.6</i>
EAM MicroCap Growth	19.6	38.9	33.9	-4.7	26.8	6.3	-5.7	1.8	57.5	17.6
<i>Russell Microcap Growth Index (Daily)</i>	<i>0.9</i>	<i>40.1</i>	<i>23.3</i>	<i>-14.2</i>	<i>16.7</i>	<i>6.9</i>	<i>-3.9</i>	<i>4.3</i>	<i>52.8</i>	<i>15.2</i>
Small Cap Value	35.6	0.3	21.3	-14.1	7.5	31.4	-5.2	3.0	36.8	15.5
<i>Russell 2000 Value TR</i>	<i>28.3</i>	<i>4.7</i>	<i>22.4</i>	<i>-12.9</i>	<i>7.8</i>	<i>31.7</i>	<i>-7.5</i>	<i>4.3</i>	<i>34.5</i>	<i>18.1</i>
AQR Capital Management	46.3	-7.1	15.2	-18.1	-1.2	31.7	-2.5	4.7	36.9	11.8
<i>Russell 2000 Value TR</i>	<i>28.3</i>	<i>4.7</i>	<i>22.4</i>	<i>-12.9</i>	<i>7.8</i>	<i>31.7</i>	<i>-7.5</i>	<i>4.3</i>	<i>34.5</i>	<i>18.1</i>

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Mellon Asset Management	25.8	5.2	24.2	-8.0	10.8	26.8	-5.8	2.6	36.7	19.0
<i>Russell 2000 Value TR</i>	28.3	4.7	22.4	-12.9	7.8	31.7	-7.5	4.3	34.5	18.1
DFA MicroCap Value	41.6	1.1	18.5	-15.7	7.3	33.3	-6.3	0.2	--	--
<i>Russell Microcap Value (Daily)</i>	34.9	6.3	21.3	-12.0	11.1	30.6	-6.5	3.1	--	--
Callan US Microcap Value	31.7	2.0	28.3	-15.8	16.4	37.2	-7.0	5.2	--	--
<i>Russell Microcap Value (Daily)</i>	34.9	6.3	21.3	-12.0	11.1	30.6	-6.5	3.1	--	--
Market Oriented (CORE)	26.6	15.2	30.1	-7.1	22.0	14.8	-1.7	11.1	33.1	16.6
<i>Russell 1000 TR</i>	26.5	21.0	31.4	-4.8	21.7	12.1	0.9	13.2	33.1	16.4
DFA Large Cap Core	27.8	12.7	29.1	-9.0	21.1	15.6	-4.6	--	--	--
<i>Russell 1000 TR</i>	26.5	21.0	31.4	-4.8	21.7	12.1	0.9	--	--	--
Russell 2000 Synthetic - OST managed	27.1	11.8	23.4	-11.3	14.5	23.4	-3.6	5.8	39.9	17.3
<i>S&P 600 Custom</i>	26.8	11.3	22.8	-11.0	14.7	21.3	-4.4	4.9	38.8	16.3
S&P 500 - OST managed	28.7	18.4	31.7	-4.4	21.8	12.0	1.5	13.7	32.5	16.0
<i>S&P 500 Index (Daily)</i>	28.7	18.4	31.5	-4.4	21.8	12.0	1.4	13.7	32.4	16.0
S&P 400 - OST managed	24.6	13.5	26.6	-10.9	16.7	21.1	-2.0	10.0	33.9	18.0
<i>S&P 400 Midcap Index (Daily)</i>	24.8	13.7	26.2	-11.1	16.3	20.7	-2.2	9.8	33.5	17.9
OST Risk Premia Strategy	24.3	15.8	31.3	-5.5	27.1	10.8	4.5	13.0	--	--
Non-U.S. Equity	12.7	13.5	22.6	-14.9	30.4	4.6	-2.6	-2.9	18.6	18.9
<i>Oregon MSCI ACWI Ex US IMI (Net)</i>	8.5	11.1	21.6	-14.8	27.8	4.4	-4.6	-3.9	15.8	17.0

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Total International Overlay Accounts										
PERS-Adrian Lee Active Currency										
PERS-P/E Global Active Currency										
PERS-Aspect Cap Active Currency										
International Market Oriented (Core)	13.1	12.5	23.2	-14.3	31.0	2.5	-1.2	-2.6	21.3	19.3
<i>MSCI World ex USA IMI Net Return</i>	<i>12.4</i>	<i>8.3</i>	<i>22.9</i>	<i>-14.7</i>	<i>25.2</i>	<i>2.9</i>	<i>-1.9</i>	<i>-4.5</i>	<i>21.6</i>	<i>16.6</i>
Arrowstreet Capital	24.5	9.1	23.2	-10.3	35.4	4.7	0.4	0.8	26.2	20.1
<i>Oregon MSCI ACWI Ex US IMI (Net)</i>	<i>8.5</i>	<i>11.1</i>	<i>21.6</i>	<i>-14.8</i>	<i>27.8</i>	<i>4.4</i>	<i>-4.6</i>	<i>-3.9</i>	<i>15.8</i>	<i>17.0</i>
Lazard Asset Management	7.1	6.9	21.0	-13.4	24.8	0.9	-1.1	-2.8	19.1	21.4
<i>Oregon MSCI ACWI Ex US (Net)</i>	<i>7.8</i>	<i>10.7</i>	<i>21.5</i>	<i>-14.2</i>	<i>27.2</i>	<i>4.5</i>	<i>-5.5</i>	<i>-3.9</i>	<i>15.3</i>	<i>16.8</i>
Lazard International CEF	4.5	30.2	29.0	-17.2	39.8	0.1	-0.2	0.6	--	--
<i>Oregon MSCI ACWI Ex US (Net)</i>	<i>7.8</i>	<i>10.7</i>	<i>21.5</i>	<i>-14.2</i>	<i>27.2</i>	<i>4.5</i>	<i>-5.5</i>	<i>-3.9</i>	<i>--</i>	<i>--</i>
AQR Capital Management	6.1	5.9	19.6	-20.3	26.8	2.1	2.4	-4.9	23.1	22.6
<i>Oregon MSCI WORLD Ex US (Net)</i>	<i>12.6</i>	<i>7.6</i>	<i>22.5</i>	<i>-14.1</i>	<i>24.2</i>	<i>2.8</i>	<i>-3.0</i>	<i>-4.3</i>	<i>21.0</i>	<i>16.4</i>
OST Int'l Risk Premia	15.6	7.7	22.8	-12.0	--	--	--	--	--	--
<i>MSCI World x US Custom Div Multiple-Factor</i>	<i>15.0</i>	<i>7.3</i>	<i>22.4</i>	<i>-12.3</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>
International Value	18.0	4.9	17.8	-12.4	25.7	9.8	-4.5	-4.3	25.0	15.1
<i>Oregon MSCI ACWI Ex US Value IMI (Net)</i>	<i>11.0</i>	<i>-0.1</i>	<i>16.3</i>	<i>-14.6</i>	<i>23.6</i>	<i>8.8</i>	<i>-8.9</i>	<i>-5.0</i>	<i>15.7</i>	<i>17.4</i>
Acadian Asset Management	21.7	11.5	19.4	-15.4	35.1	11.8	-7.2	-3.7	21.9	19.7
<i>Oregon MSCI ACWI Ex US Value IMI (Net)</i>	<i>11.0</i>	<i>-0.1</i>	<i>16.3</i>	<i>-14.6</i>	<i>23.6</i>	<i>8.8</i>	<i>-8.9</i>	<i>-5.0</i>	<i>15.7</i>	<i>17.4</i>
Brandes Investment Partners	14.1	-1.3	16.4	-9.4	16.3	7.9	-1.6	-5.0	28.3	10.5
<i>Oregon MSCI ACWI Ex US Value (Net)</i>	<i>10.5</i>	<i>-0.8</i>	<i>15.7</i>	<i>-14.0</i>	<i>22.7</i>	<i>8.9</i>	<i>-10.1</i>	<i>-5.1</i>	<i>15.0</i>	<i>17.0</i>

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
International Growth	12.4	19.9	28.1	-6.4	27.5	1.3	1.9	-4.3	18.8	18.3
<i>Oregon MSCI WORLD Ex US (Net)</i>	12.6	7.6	22.5	-14.1	24.2	2.8	-3.0	-4.3	21.0	16.4
Walter Scott Management	12.4	19.9	28.0	-6.3	27.5	6.4	1.2	-3.1	13.1	20.3
<i>Oregon MSCI WORLD Ex US (Net)</i>	12.6	7.6	22.5	-14.1	24.2	2.8	-3.0	-4.3	21.0	16.4
International Small Cap	18.1	9.3	24.1	-24.3	30.2	4.9	6.1	-6.5	29.1	18.7
<i>MSCI World Ex US Small Cap Value (Net)</i>	13.3	2.6	22.8	-18.4	27.9	7.9	1.1	-5.9	27.7	19.5
DFA International Small Cap	16.9	1.1	20.9	-23.3	27.4	9.6	2.5	-6.6	32.9	20.5
<i>MSCI World Ex US Small Cap Value (Net)</i>	13.3	2.6	22.8	-18.4	27.9	7.9	1.1	-5.9	27.7	19.5
Harris Associates	20.1	5.0	33.4	-24.1	27.2	7.1	1.0	-6.7	30.9	17.9
<i>MSCI ACWI ex USA Small Cap Value (Net)</i>	14.1	4.7	20.3	-18.2	29.9	8.2	-1.2	-4.5	20.9	20.2
EAM International Micro Cap	17.8	38.4	20.3	-33.6	45.3	2.2	23.5	--	--	--
<i>Oregon FTSE Global Ex US Micro Cap</i>	18.0	27.9	16.6	-20.0	31.4	6.0	2.9	--	--	--
DFA International Micro Cap	17.1	5.7	18.5	-22.0	30.9	11.9	-1.8	--	--	--
<i>Oregon FTSE Global Ex US Micro Cap</i>	18.0	27.9	16.6	-20.0	31.4	6.0	2.9	--	--	--
Emerging Markets	4.3	23.5	22.1	-17.4	35.7	10.3	-14.5	1.2	-0.1	21.7
<i>ORE MSCI Emerging Markets IMI (Net)</i>	-0.3	18.4	17.6	-15.0	37.0	9.9	-13.9	-1.8	-2.2	18.7
Genesis Emerging Markets	-6.6	17.5	29.3	-15.9	33.6	12.0	-14.9	-1.0	0.7	21.6
<i>ORE MSCI Emerging Markets IMI (Net)</i>	-0.3	18.4	17.6	-15.0	37.0	9.9	-13.9	-1.8	-2.2	18.7
Arrowstreet Emerging Markets	9.6	32.1	23.7	-19.5	35.4	11.2	-15.8	1.1	-1.0	22.8
<i>ORE MSCI Emerging Markets IMI (Net)</i>	-0.3	18.4	17.6	-15.0	37.0	9.9	-13.9	-1.8	-2.2	18.7
Westwood Global Investment	3.6	10.1	9.8	-9.3	29.5	19.0	-16.1	0.2	0.6	18.4
<i>MSCI Emerging Markets IMI Net</i>	-0.3	18.4	17.6	-15.0	37.3	11.2	-14.9	-2.2	-2.6	18.2

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
William Blair and Company	4.4	41.4	29.1	-21.6	50.2	1.9	-14.1	5.7	0.9	21.5
<i>MSCI Emerging Markets Growth Net</i>	-8.4	31.3	25.1	-18.3	37.3	11.2	-14.9	-2.2	-2.6	18.2
William Blair Emerging Mkt Small Cap	17.9	33.0	21.7	-24.4	38.5	-4.3	-5.9	14.9	--	--
<i>MSCI Emerging Markets Small Cap Gr Net</i>	20.4	25.6	12.0	-20.0	33.8	2.3	-6.8	1.0	--	--
OST EM Risk Premia ESG										
Global Equity	15.5	7.4	21.6	-7.9	22.3	9.4	-3.3	6.9	35.6	12.6
<i>MSCI ACWI IMI Net (Daily)</i>	18.2	16.3	26.4	-10.1	24.0	8.3	-2.1	3.8	23.5	16.4
Alliance Bernstein Global Value	18.1	4.2	20.1	-19.1	21.8	9.3	-3.3	6.9	35.6	12.6
<i>Oregon MSCI ACWI Value (Net)</i>	19.6	-0.3	20.6	-10.8	18.3	12.6	-6.3	2.9	22.4	15.5
Global Equity Low Volatility	15.2	7.9	21.7	-5.5	22.5	--	--	--	--	--
<i>MSCI AC World (Daily Const)</i>	18.5	16.3	26.6	-9.4	24.0	--	--	--	--	--
LACM Global Equity Low Volatility	15.4	15.0	23.1	-6.6	22.7	--	--	--	--	--
<i>MSCI AC World (Daily Const)</i>	18.5	16.3	26.6	-9.4	24.0	--	--	--	--	--
Arrowstreet Global Low Volatility	15.1	12.6	22.3	-2.7	--	--	--	--	--	--
<i>MSCI ACWI IMI Net (Daily)</i>	18.2	16.3	26.4	-10.1	--	--	--	--	--	--
AQR Global Low Volatility	11.4	6.8	19.6	-5.7	--	--	--	--	--	--
<i>MSCI AC World (Daily Const)</i>	18.5	16.3	26.6	-9.4	--	--	--	--	--	--
Acadian Global Low Volatility	17.5	-1.9	20.2	-7.0	--	--	--	--	--	--
<i>MSCI ACWI IMI Net (Daily)</i>	18.2	16.3	26.4	-10.1	--	--	--	--	--	--
DFA Global Low Volatility	17.2	5.5	--	--	--	--	--	--	--	--
<i>MSCI AC World (Daily Const)</i>	18.5	16.3	--	--	--	--	--	--	--	--

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Other Equity										
Transitional & Closed Accounts										
PERS- Equity Distribution										
Total Real Estate	19.0	2.7	7.2	8.0	10.0	7.9	9.9	14.2	12.8	13.6
NCREIF ODCE (Custom) (Adj.)	13.6	0.6	4.7	7.7	6.7	8.9	13.5	11.3	11.0	11.0
Real Estate excluding REITS	18.6	3.0	7.3	8.9	11.2	10.0	12.7	12.0	15.8	10.8
NCREIF ODCE (Custom) (Adj.)	13.6	0.6	4.7	7.7	6.7	8.9	13.5	11.3	11.0	11.0
Total REITS	28.2	-0.9	7.2	-2.0	9.8	1.1	2.0	22.2	2.2	26.1
ABKB - LaSalle Advisors	36.2	3.0	29.9	3.2	7.4	5.4	2.9	32.1	1.6	17.7
Nareit Equity Share Price Index	41.3	-5.2	28.7	-4.0	8.7	8.6	2.8	28.0	2.8	19.7
Woodbourne Investment Management	9.9	0.6	18.5	-4.8	10.6	4.3	8.6	19.5	-1.8	15.8
Nareit Equity Share Price Index	41.3	-5.2	28.7	-4.0	8.7	8.6	2.8	28.0	2.8	19.7
Risk Parity	13.7	--								
S&P Risk Parity - 12% Target Volatility	18.2	--	--	--	--	--	--	--	--	--
Man AHL Target Risk	17.0	--	--	--	--	--	--	--	--	--
S&P Risk Parity - 12% Target Volatility	18.2	--	--	--	--	--	--	--	--	--
PanAgora Risk Parity	9.0	--	--	--	--	--	--	--	--	--
S&P Risk Parity - 12% Target Volatility	18.2	--	--	--	--	--	--	--	--	--
Bridgewater All Weather	15.5	--	--	--	--	--	--	--	--	--
S&P Risk Parity - 12% Target Volatility	18.2	--	--	--	--	--	--	--	--	--

	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)	2012 (%)
Opportunity Portfolio	22.7	10.2	6.2	5.8	10.5	6.1	2.1	8.8	15.0	18.4
<i>CPI + 5%</i>	12.4	6.4	7.4	7.0	7.2	7.2	5.8	5.8	6.6	6.8
Portfolio Holdings - Opportunity	2.7	-5.5	-44.4	-46.6	-28.9	45.1	-48.9	-12.0	17.1	--
Alternative Portfolio	14.8	-6.6	-1.3	-2.4	8.3	6.6	-4.3	4.4	6.0	-0.8
<i>CPI +4%</i>	11.3	5.4	6.4	6.0	6.2	6.2	4.8	4.8	5.6	5.8
Diversifying Strategies	8.7	-11.6	-1.0	-13.1	8.8	0.8	8.1	9.4	7.9	3.7
Real Assets	19.0	-2.0	-1.6	6.5	10.5	--	--	--	--	--
<i>CPI +4%</i>	11.3	5.4	6.4	6.0	6.2	--	--	--	--	--
Infrastructure	16.6	5.6	8.9	--	--	--	--	--	--	--
<i>CPI +4%</i>	11.3	5.4	6.4	--	--	--	--	--	--	--
Natural Resources	23.9	-12.8	-12.5	--	--	--	--	--	--	--
<i>CPI +4%</i>	11.3	5.4	6.4	--	--	--	--	--	--	--
Private Equity	41.8	12.7	11.1	18.1	17.3	6.3	7.3	15.9	16.2	14.4
<i>Russell 3000 + 300 BPS QTR LAG (Adj.)</i>	35.7	18.4	6.0	21.1	22.2	18.4	2.5	21.2	25.2	34.0
Cash	0.1	1.6	3.3	2.0	1.3	1.2	0.5	0.5	0.7	1.7
<i>ICE BofA US 3-Month Treasury Bill</i>	0.1	0.7	2.3	1.9	0.9	0.3	0.0	0.0	0.1	0.1
PERS-Russell Overlay Cash Balance										

Disclaimer, Glossary, and Notes

WE HAVE PREPARED THIS REPORT (THIS "REPORT") FOR THE SOLE BENEFIT OF THE INTENDED RECIPIENT (THE "RECIPIENT").

SIGNIFICANT EVENTS MAY OCCUR (OR HAVE OCCURRED) AFTER THE DATE OF THIS REPORT AND THAT IT IS NOT OUR FUNCTION OR RESPONSIBILITY TO UPDATE THIS REPORT. ANY OPINIONS OR RECOMMENDATIONS PRESENTED HEREIN REPRESENT OUR GOOD FAITH VIEWS AS OF THE DATE OF THIS REPORT AND ARE SUBJECT TO CHANGE AT ANY TIME. ALL INVESTMENTS INVOLVE RISK. THERE CAN BE NO GUARANTEE THAT THE STRATEGIES, TACTICS, AND METHODS DISCUSSED HERE WILL BE SUCCESSFUL.

INFORMATION USED TO PREPARE THIS REPORT WAS OBTAINED FROM INVESTMENT MANAGERS, CUSTODIANS, AND OTHER EXTERNAL SOURCES. WHILE WE HAVE EXERCISED REASONABLE CARE IN PREPARING THIS REPORT, WE CANNOT GUARANTEE THE ACCURACY OF ALL SOURCE INFORMATION CONTAINED HEREIN.

CERTAIN INFORMATION CONTAINED IN THIS REPORT MAY CONSTITUTE "FORWARD - LOOKING STATEMENTS," WHICH CAN BE IDENTIFIED BY THE USE OF TERMINOLOGY SUCH AS "MAY," "WILL," "SHOULD," "EXPECT," "AIM", "ANTICIPATE," "TARGET," "PROJECT," "ESTIMATE," "INTEND," "CONTINUE" OR "BELIEVE," OR THE NEGATIVES THEREOF OR OTHER VARIATIONS THEREON OR COMPARABLE TERMINOLOGY. ANY FORWARD-LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION ARE BASED UPON CURRENT ASSUMPTIONS. CHANGES TO ANY ASSUMPTIONS MAY HAVE A MATERIAL IMPACT ON FORWARD - LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS. ACTUAL RESULTS MAY THEREFORE BE MATERIALLY DIFFERENT FROM ANY FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION.

PERFORMANCE DATA CONTAINED HEREIN REPRESENT PAST PERFORMANCE. PAST PERFORMANCE IS NO GUARANTEE OF FUTURE RESULTS.

Credit Risk: Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security).

Duration: Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. A bond with a duration of six years will exhibit twice the percentage price change of a bond with a three-year duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

Information Ratio: This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

Jensen's Alpha: A measure of the average return of a portfolio or investment in excess of what is predicted by its beta or "market" risk. $\text{Portfolio Return} - [\text{Risk Free Rate} + \text{Beta} * (\text{market return} - \text{Risk Free Rate})]$.

Market Capitalization: For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

Market Weighted: Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

Maturity: The date on which a loan, bond, mortgage, or other debt/security becomes due and is to be paid off.

Prepayment Risk: The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

Price-Book Value (P/B) Ratio: The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

Price-Earnings (P/E) Ratio: A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about its future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

Quality Rating: The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

Sharpe Ratio: A commonly used measure of risk-adjusted return. It is calculated by subtracting the risk free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

STIF Account: Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

Standard Deviation: A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

Style: The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

Tracking Error: A divergence between the price behavior of a position or a portfolio and the price behavior of a benchmark, as defined by the difference in standard deviation.

Yield to Maturity: The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a “basis book.” For example, a 5% bond pays \$5 a year interest on each \$100 par value. To figure its current yield, divide \$5 by \$95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay \$100 for the bond that can be bought now for \$95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{5\% \text{ (discount)}}{5 \text{ (yrs. to maturity)}} = 1\% \text{ pro rata, plus } 5.26\% \text{ (current yield)} = 6.26\% \text{ (yield to maturity)}$$

Yield to Worst: The lowest potential yield that can be received on a bond without the issuer actually defaulting. The yield to worst is calculated by making worst-case scenario assumptions on the issue by calculating the returns that would be received if provisions, including prepayment, call, or sinking fund, are used by the issuer.

NCREIF Property Index (NPI): Measures unleveraged investment performance of a very large pool of individual commercial real estate properties acquired in the private market by tax-exempt institutional investors for investment purposes only. The NPI index is capitalization-weighted for a quarterly time series composite total rate of return.

NCREIF Fund Index - Open End Diversified Core Equity (NFI-ODCE): Measures the investment performance of 28 open-end commingled funds pursuing a core investment strategy that reflects funds' leverage and cash positions. The NFI-ODCE index is equal-weighted and is reported gross and net of fees for a quarterly time series composite total rate of return.

Sources: Investment Terminology, International Foundation of Employee Benefit Plans, 1999.

The Handbook of Fixed Income Securities, Fabozzi, Frank J., 1991

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Throughout this report, numbers may not sum due to rounding.

Returns for periods greater than one year are annualized throughout this report.

Values shown are in millions of dollars, unless noted otherwise.



To: The Oregon Investment Council

From: Karl Cheng, Senior Investment Officer, Portfolio Risk & Research

Re: Third Quarter 2022 Risk Report for the Oregon Public Employees Retirement Fund

Executive Summary

This memo summarizes OPERF’s predicted volatility, as estimated by Aladdin, Treasury’s end-to-end investment analytics platform built by BlackRock. As of September 30, 2022, OPERF has an estimated return volatility of 15.2%, higher than that for the target allocation presented by Meketa Investment Group (“Meketa”) at the September 2022 meeting.

The realized tracking errors for the liquid portion of the Fund, mainly the Public Equity and Fixed Income Portfolios, are within OIC guidelines. While the predicted active risk for the Fixed Income Portfolio is also within its policy limit, that for the Public Equity Portfolio exceeds its respective policy limit. Since this is mainly due to the Portfolio’s low volatility tilt in this market environment and not due to a substantive change, **Staff recommends no action at this point.**

OPERF Asset Allocation

Investment Belief #2 in [INV 1201: Statement of OIC Investment and Management Beliefs](#) states: “Asset Allocation Drives Risk and Return”. Shown in the table below are OPERF’s target allocations approved by the Council at the June 2021 meeting.

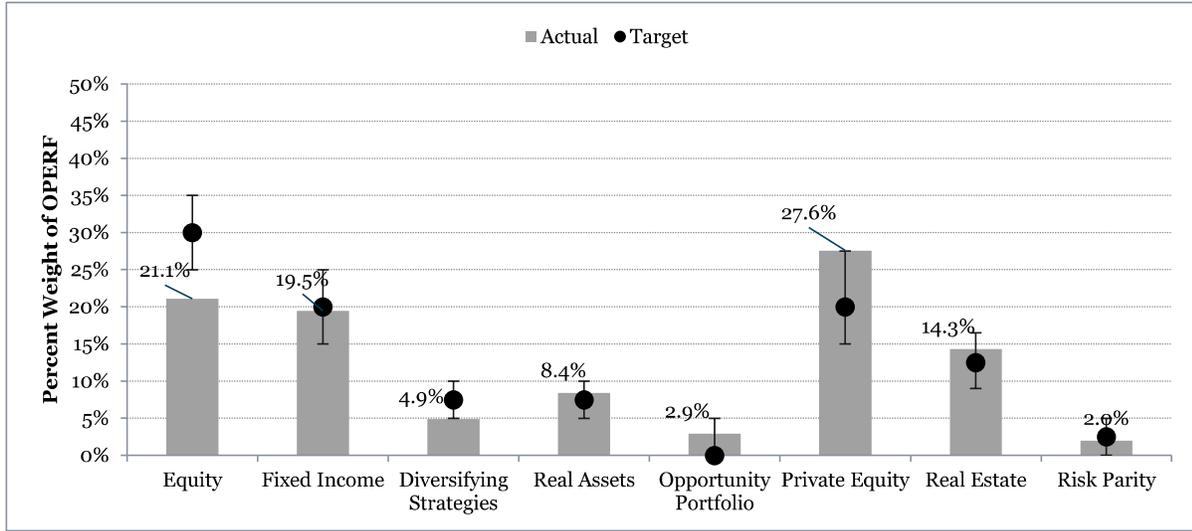
Table 1. OPERF Target Asset Allocation

Asset Class	Target Allocation (%)	Rebalancing Range (%)
Public Equity	30.0	25.0 – 35.0
Private Equity	20.0	15.0 – 27.5
Fixed Income	20.0	15.0 – 25.0
Real Estate	12.5	9.0 – 16.5
Real Assets	7.5	5.0 – 10.0
Diversifying Strategies	7.5	5.0 – 10.0
Risk Parity	2.5	0.0 – 5.0
Total Fund	100.0	

Including the synthetic overlays exposures managed by Russell Investments, Figure 1 below shows OPERF’s allocation.



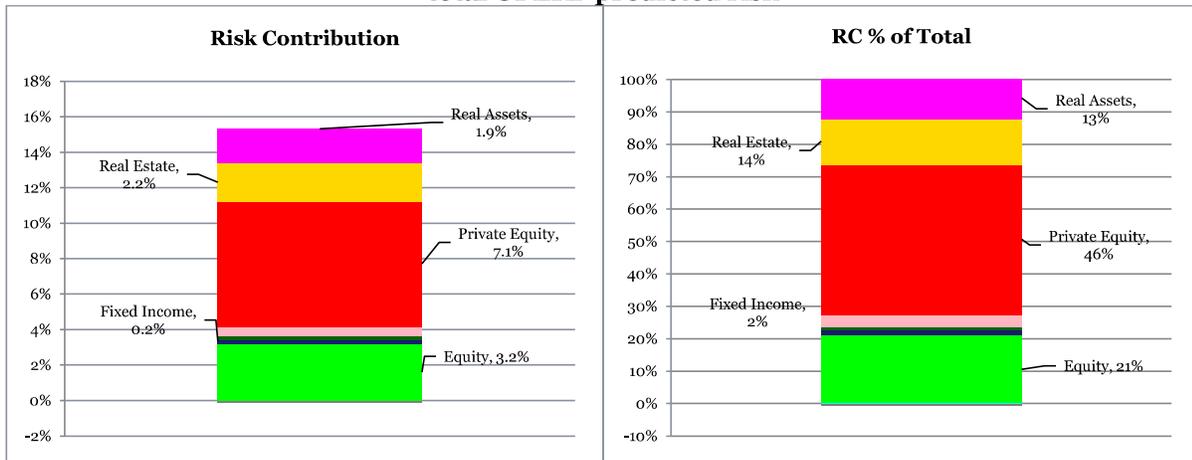
Figure 1. OPERF Actual Allocation versus Target



OPERF Predicted Risk

The risk estimates are shown in the charts below.

Figure 2. OPERF Risk Contribution by Asset Class and Risk Contribution as a percent of total OPERF predicted risk



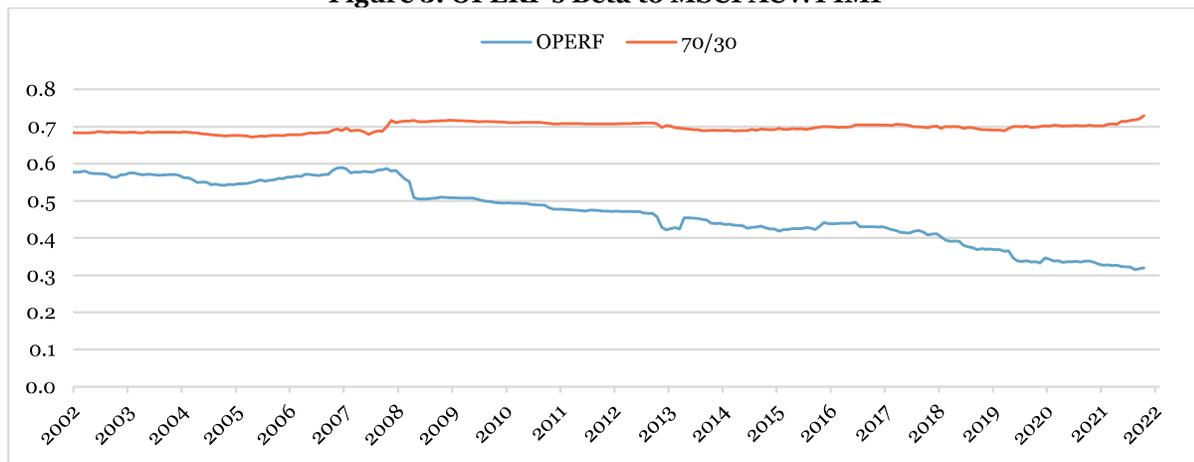
The total predicted **standard deviation, or volatility**, for OPERF is 15.2% as of September 30, 2022. To put that in context, Meketa, the OIC’s investment consultant, estimates OPERF’s long-term volatility to be

11.9% using their 2022 Capital Market Assumptions, which are a blend of assumptions from staff, Meketa, and Aon Investments, the Council’s secondary investment consultant. Aladdin’s model uses a medium-term, five-year lookback period so there will almost always be some difference between the two estimates.

Another item of note from Figure 2 is that “equity” risk, that is the predicted risk contributions from the Public Equity and Private Equity Portfolios, is estimated to be 67% of OPERF’s predicted risk. This is down from 83% of then predicted risk a year ago. Equity risk has always been the largest risk contributor to OPERF. OIC Investment Belief #3 summarizes the Council’s objective for investing in equity: “Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.” However, public equity allocation declined from 27.7% a year ago to 21.1% while those of Real Assets and Real Estate increased, mainly due to a concerted effort to diversify the Fund from equity risk and partly due to the broader decline in equity valuations in 2022.

The OIC-approved changes have reduced OPERF’s volatility over time. Figure 3 below plots OPERF’s rolling 20-quarter realized beta to MSCI ACWI IMI as well as that of the 70% MSCI ACWI IMI & 30% Bloomberg U.S. Aggregate Index blend, or the “Reference Portfolio”. OPERF’s realized beta hovered around +0.60 in the earlier portion of the analysis period before starting a steady decline. Part of that decline is due to an increasing allocation to illiquid investments, which tend to have performance smoothing, but the other cause is the aforementioned diversification.

Figure 3. OPERF's Beta to MSCI ACWI IMI



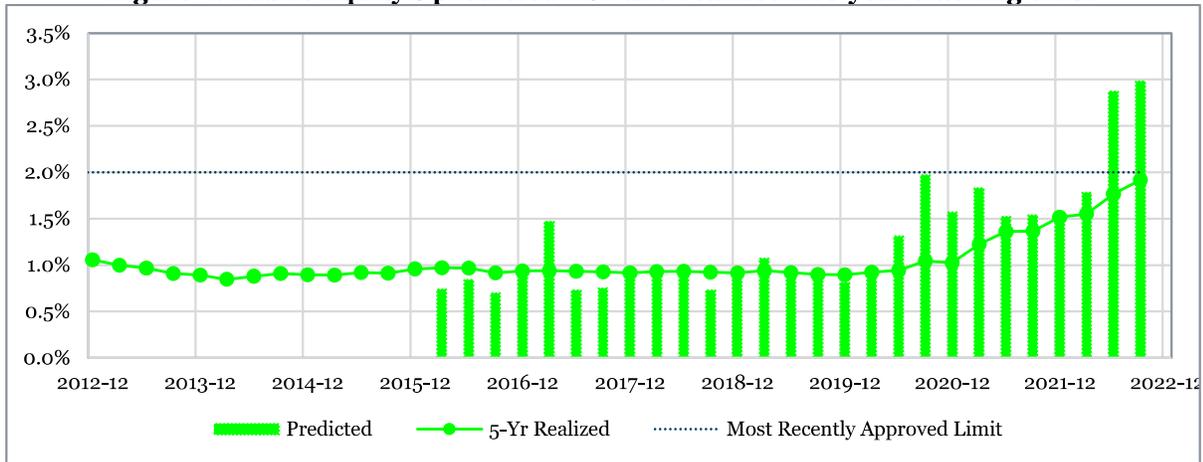
Capital Markets

Public Equity

The Public Equity Portfolio has an OIC-approved **tracking error** range of 0.75% to 2.00%. Using monthly performance data from State Street, the five-year *ex post* tracking error through September 30, 2022 for the Portfolio is 1.9%, within the approved range. However, Aladdin estimates an *ex ante* active risk of 3.0%. Equity market volatility ramped up since the beginning of 2022 due to geopolitical, inflation, and recession concerns. While the global low volatility strategies contributed positive relative performances to the Public

Equity Portfolio year to date, the active risk due to the low volatility tilt also became more meaningful, which is consistent with staff's expectation of how this portion of the Portfolio would behave in a "risk off" market. As such, staff recommends no action at this point.

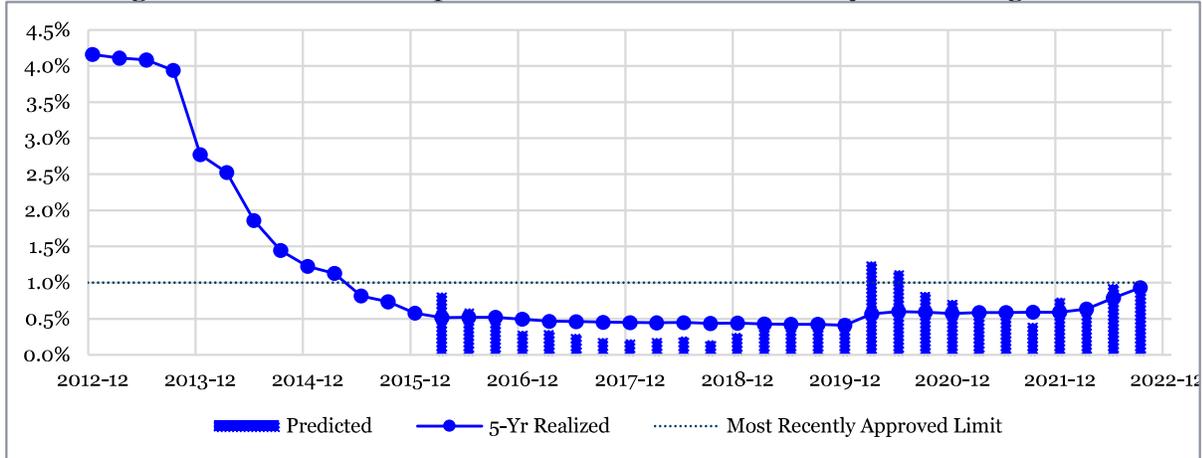
Figure 4. Public Equity's predicted risk and realized five-year tracking error



Fixed Income

The Fixed Income Portfolio has an OIC-approved **tracking error** of up to 1.0%. Using monthly performance data from State Street, the five-year tracking error through September 30, 2022 for the Portfolio is 0.9%, within the approved range. Similar to what occurred for Public Equity, predicted active risk also increased in 2022 due to market environment.

Figure 5. Fixed Income's predicted risk and realized five-year tracking error



OPERF Cash Flow

Table 2 below summarizes approximate net investment cash flow and pension cash flow for Year-to-Date 2022 and for the past five years.

Table 2. OPERF Net Cash Flow by Portfolio by Time Period

Asset Class	Net Cash Flow (\$M)					
	YTD 2022	2021	2020	2019	2018	2017
Public Equity	3,286	4,220	3,062	2,752	3,432	1,451
Private Equity	435	2,730	494	347	1,216	1,434
Fixed Income	-1,645	-3,053	3,154	327	61	21
Real Estate	-348	-396	15	-48	-28	508
Real Assets	-682	-572	-564	-578	-524	-306
Diversifying Strategies	-248	381	-621	-490	-1,349	-395
Opportunity	-109	-248	71	26	156	-2
Risk Parity	0	0	-1,800	0	0	0
Other	274	-227	-449	283	-15	0
Total Fund	963	2,836	3,362	2,617	2,948	2,711
Net Pension	-2,036	-1,743	-3,041	-2,659	-2,774	-3,195

The estimated uncalled commitments from the private market portfolios are tabulated below.

Asset Class Portfolio	Uncalled Commitment (\$B)
Private Equity	\$8.8
Real Assets	\$3.0
Real Estate	\$3.8
Opportunity	\$1.2
Total	\$16.8



To: The Oregon Investment Council

From: Jen Plett, Investment Officer, Portfolio Risk & Research

Re: Third Quarter 2022 Risk Report for the Common School Fund (CSF)

Executive Summary

This memo summarizes CSF’s predicted volatility, as estimated by Aladdin, Treasury’s end-to-end investment analytics platform built by BlackRock. As of September 30, 2022, Aladdin estimated a return volatility of 12.2% for CSF, in-line with staff’s expectation. Therefore, staff recommends no additional action at this point.

CSF Asset Allocation

Investment Belief #2 in INV 1201: Statement of OIC Investment and Management Beliefs states: “*Asset Allocation Drives Risk and Return*”. On July 20, 2022, OIC approved CSF’s new Strategic Asset Allocation (SAA) recommendations presented by staff and the consultant AON:

- Increasing Private Equity from current 10% to 15%;
- Reducing Fixed Income from 25% to 20%;
- Splitting Alternative Investments evenly to Real Assets and Diversifying Strategies.

Applying AON’s 10-Year Capital Market Assumptions to CSF’s new approved target allocations produces an estimated return volatility of 12.5%. A “Reference Portfolio” can be constructed with 70% in the MSCI ACWI IMI and 30% in the Bloomberg U.S. Aggregate Bond Index that would reach a similar level of estimated volatility. Prior to the recent change in allocations, CSF’s Reference Portfolio was approximated to be a 65/35 split between public equity and fixed income indices.

Shown in the table below are CSF’S target allocations as of 9/30/2022.

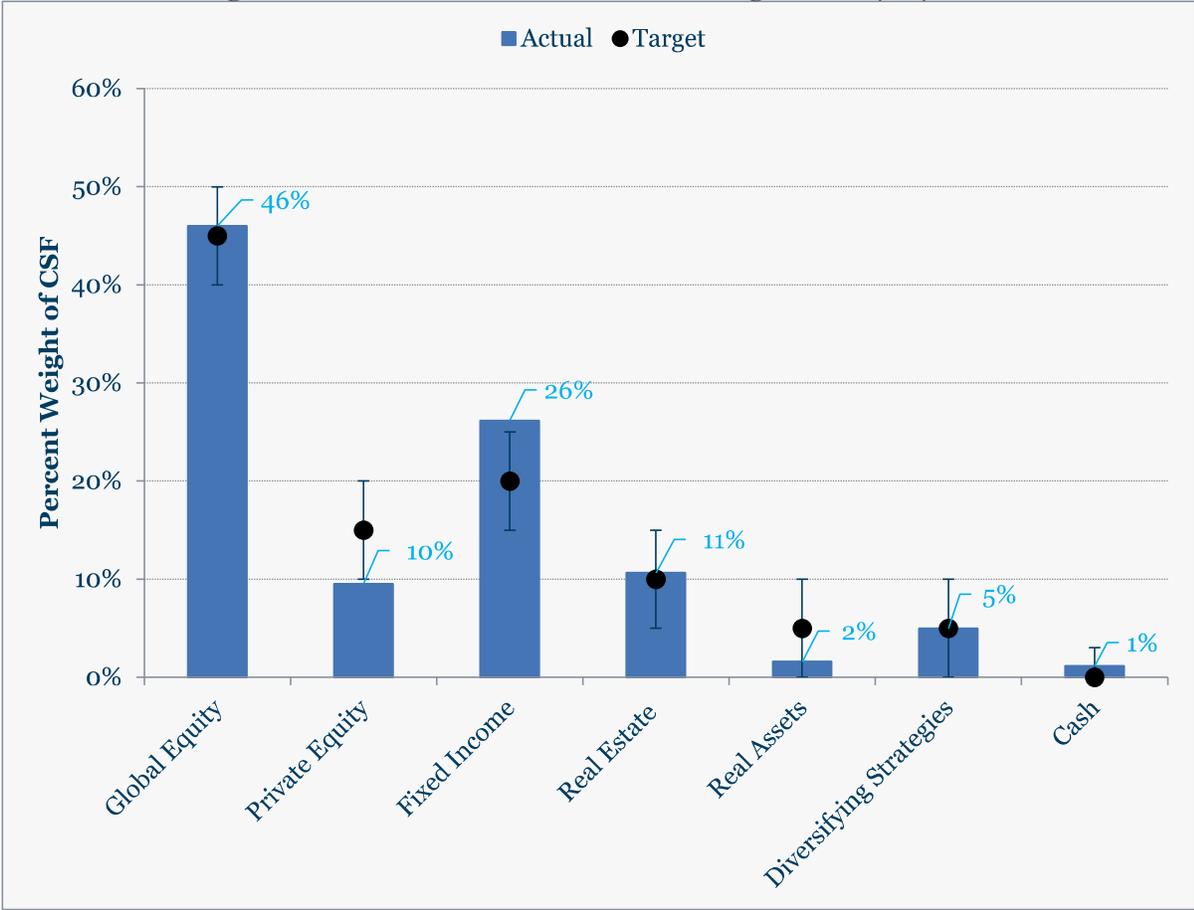
**Table 1. CSF Target Asset Allocation
as of 9/30/2022**

Asset Class	Target Allocation (%)	Interim Target (%)	Rebalancing Range (%)
Global Equity	45	47.5	40 - 50
Private Equity	15	12.5	10 - 20
Fixed Income	20	22.5	15 - 25
Real Estate	10	10.0	5 - 15
Real Assets	5	2.5	0 - 10
Diversifying Strategies	5	5.0	0 - 10
Cash	0	0	0 - 3
Total Fund	100	100.0	

Figure 1 below shows CSF’s actual allocation as of 9/30/2022.



Figure 1. CSF Actual Allocation versus Target as of 9/30/2022

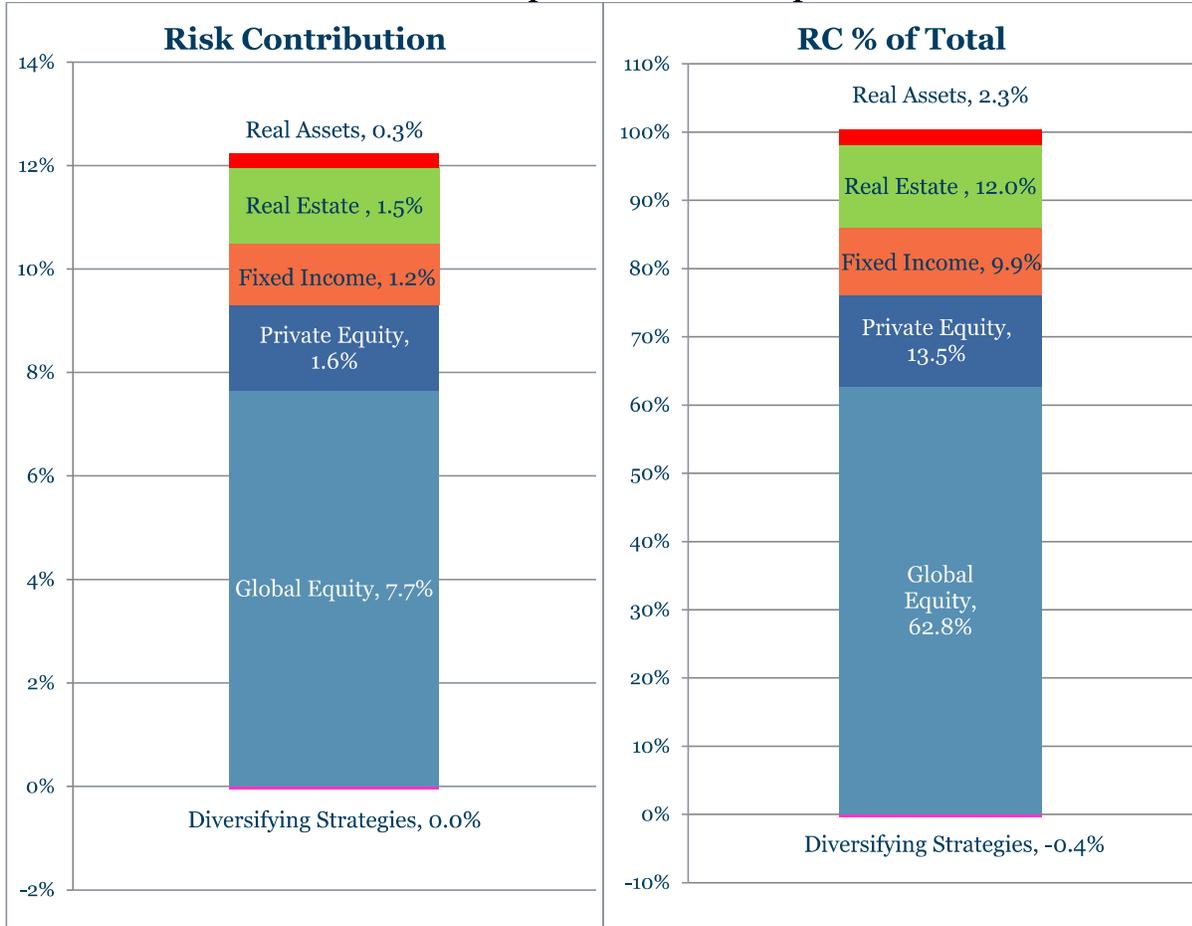


As of September 30, 2022, actual CSF asset allocations were within the policy tolerances relative to the established targets, except for Fixed Income, which the OIC recently approved lowering the allocation from 25% to 20%.

CSF Predicted Risk

The risk estimates are shown in the charts below.

Figure 2. CSF Risk Contribution by Asset Class and Risk Contribution as a percent of total CSF predicted risk



The total predicted **standard deviation**, or **volatility**, for CSF is 12.2% as of September 30, 2022. Aladdin’s risk model uses a medium-term, five-year lookback.

Another item of note from Figure 2 is that “equity” risk, that is the predicted risk contributions from Global Equity and Private Equity, is estimated to be 76% of CSF’s predicted risk. Equity risk has always been the largest risk contributor to CSF. OIC Investment Belief #3 summarizes the Council’s objective for investing in equity: “*Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.*” However, equity investments are much more volatile than investment grade fixed income and U.S. Treasuries.

Until the approval of SAA on July 20, 2022, the OIC-approved changes have reduced CSF’s volatility over time. Figure 3 below plots CSF’s rolling 20-quarter realized beta to MSCI ACWI IMI as well as that of the Reference Portfolio of 70% MSCI ACWI IMI and 30% Bloomberg U.S. Aggregate Bond Index. CSF’s realized beta was elevated during the Great Financial Crisis from 2007 to 2009 before steadily trending down. Part

of that decline is due to an increasing allocation to illiquid investments, which tend to have performance smoothing, but the other cause is the improved diversification.

Figure 3. CSF's Beta to MSCI ACWI IMI

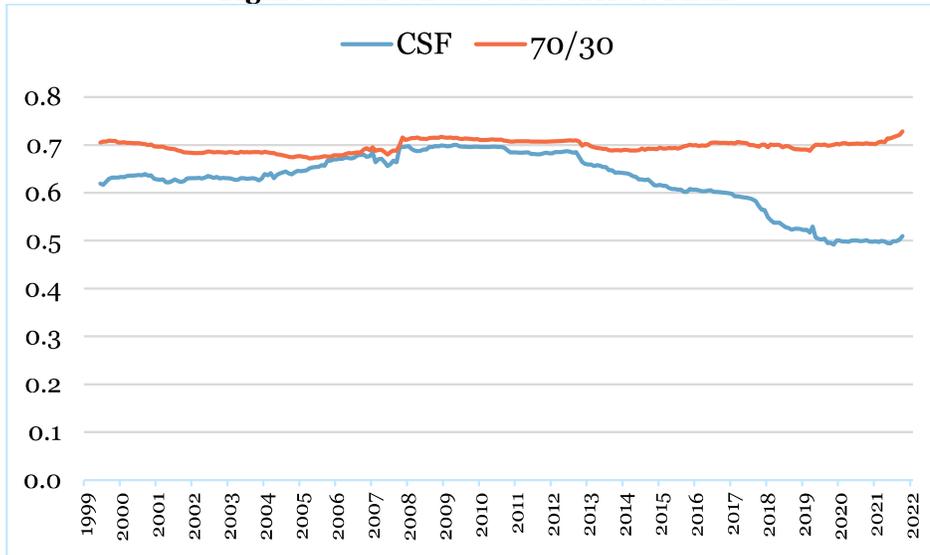
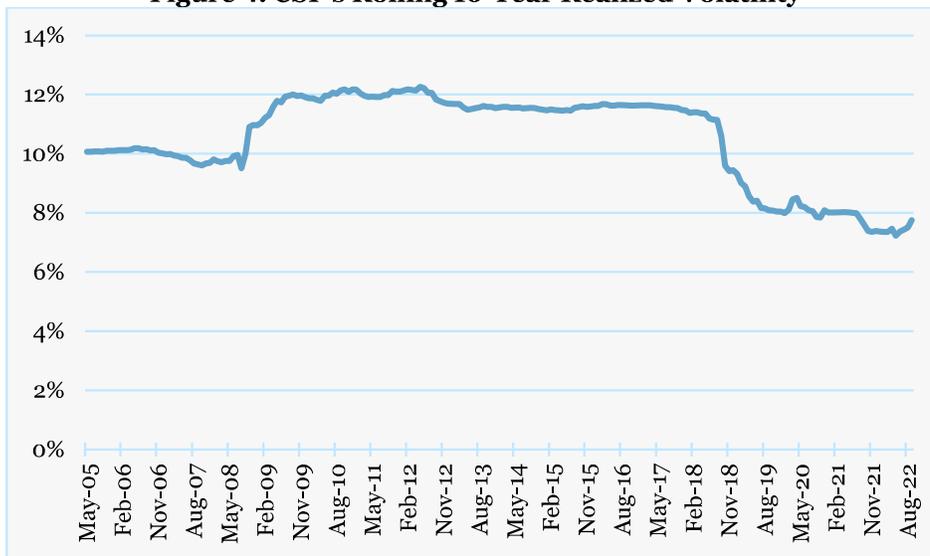


Figure 4. CSF's Rolling 10-Year Realized Volatility



O I C



OREGON
STATE
TREASURY

TAB 7

ASSET ALLOCATION & NAV UPDATES

Asset Allocations at October 31, 2022

OPERF	Regular Account							Target Date Funds	Variable Fund	Total Fund
	Policy	Target ¹	\$ Thousands	Pre-Overlay	Overlay	Net Position	Actual	\$ Thousands	\$ Thousands	\$ Thousands
Public Equity	25.0-35.0%	30.0%	19,363,205	21.3%	331,454	19,694,659	21.6%	1,164,809	256,359	21,115,827
Private Equity	15.0-27.5%	20.0%	24,480,522	26.9%		24,480,522	26.9%			24,480,522
Total Equity	45.0-55.0%	50.0%	43,843,727	48.2%	331,454	44,175,180	48.5%	2,121,987	6,935	45,596,349
Opportunity Portfolio	0-5%	0.0%	2,411,594	2.7%		2,411,594	2.7%			2,411,594
Fixed Income	15-25%	20.0%	14,835,602	16.3%	2,513,552	17,349,153	19.1%			19,471,140
Risk Parity	0.0-3.5%	2.5%	1,676,871	1.8%		1,676,871	1.8%			1,676,871
Real Estate	7.5-17.5%	12.5%	13,428,209	14.8%	(1,300)	13,426,909	14.8%			13,426,909
Real Assets	2.5-10.0%	7.5%	7,853,499	8.6%		7,853,499	8.6%			7,853,499
Diversifying Strategies	2.5-10.0%	7.5%	4,059,616	4.5%		4,059,616	4.5%			4,059,616
Cash ²	0-3%	0.0%	2,892,113	3.2%	(2,843,705)	48,407	0.1%			55,342
TOTAL OPERF		100%	\$ 91,001,229	100.0%	\$ -	\$ 91,001,229	100.0%	\$ 3,286,797	\$ 263,294	\$ 94,551,320

¹Targets established in October 2021. Interim policy benchmark effective October 1, 2021, consists of: 30% MSCI ACWI IMI Net, 20% Bloomberg U.S. Aggregate, 20% Russell 3000+300bps (1 quarter lagged), 12.5% NCREIF ODCE net (1 quarter lagged), 7.5% CPI+400bps, 7.5% HFRI FOF Conservative & 2.5% S&P Risk Parity - 12% Target Volatility.

² Includes cash held in the policy implementation overlay program.

SAIF	Policy	Target	\$ Thousands	Actual
Total Equity	7-13%	10.0%	413,560	10.0%
Fixed Income	80-90%	85.0%	3,369,133	81.3%
Real Estate	0-7%	5.0%	309,065	7.5%
Cash	0-3%	0.0%	49,951	1.2%
TOTAL SAIF			\$ 4,141,708	100.0%

CSF	Policy	Target	\$ Thousands	Actual
Global Equities	40-50%	45.0%	980,912	47.8%
Private Equity	8-12%	10.0%	189,918	9.3%
Total Equity	58-62%	55.0%	1,170,830	57.1%
Fixed Income	20-30%	25.0%	517,493	25.2%
Real Estate	0-12%	10.0%	212,293	10.3%
Alternative Investments	0-12%	10.0%	77,074	3.8%
Cash	0-3%	0.0%	74,173	3.6%
TOTAL CSF			\$ 2,051,863	100.0%

SOU E	Policy	Target	\$ Thousands	Actual
Global Equities	0-65%	N/A	1,813	75.0%
Fixed Income	35-100%	N/A	603	24.9%
Cash	0-3%	N/A	1	0.0%
TOTAL SOUE			\$ 2,417	100.0%

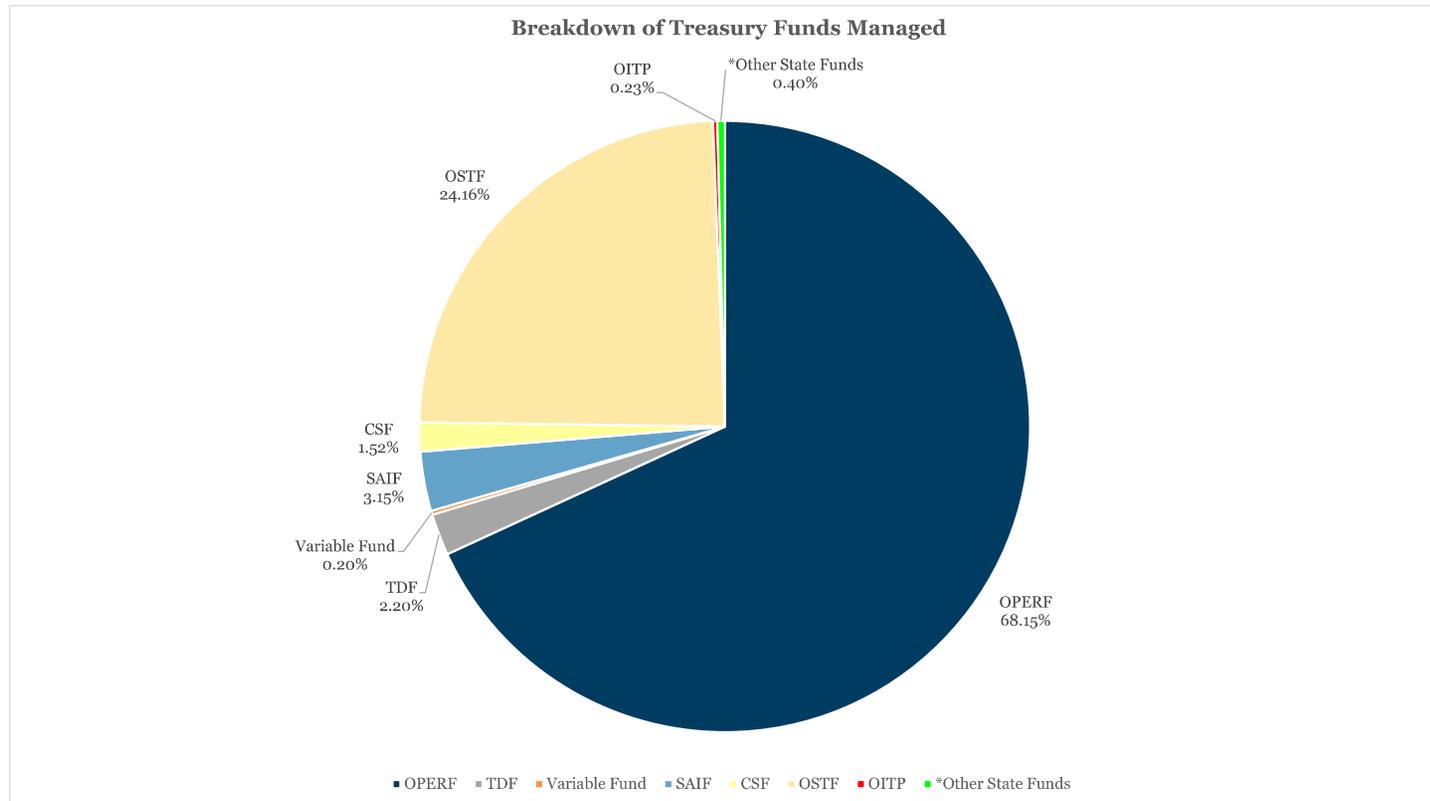
WOUE	Policy	Target	\$ Thousands	Actual
Global Equities	30-65%	55.0%	1,444	55.8%
Fixed Income	35-60%	40.0%	1,010	39.0%
Cash	0-25%	5.0%	134	5.2%
TOTAL WOUE			\$ 2,588	100.0%

Oregon State Treasury Funds Managed as of October 31, 2022

OSTF, OITP & Other State Funds*	\$ Thousands	Actual
OSTF	31,412,389	94.7%
OITP	296,421	0.9%
DAS Insurance Fund	130,666	0.4%
DCBS Operating Fund	182,725	0.6%
DCBS Workers Benefit Fund	130,881	0.4%
DCHS - Elderly Housing Bond Sinking Fund	1,235	0.0%
DCHS - Other Fund	13,385	0.0%
Oregon Lottery Fund	102,161	0.3%
DVA Bond Sinking Fund	104,293	0.3%
ODOT Fund	226,392	0.7%
OLGIF	228,431	0.7%
OPUF	351,296	1.1%
Total OSTF & Other State Funds	\$ 33,180,276	100.0%

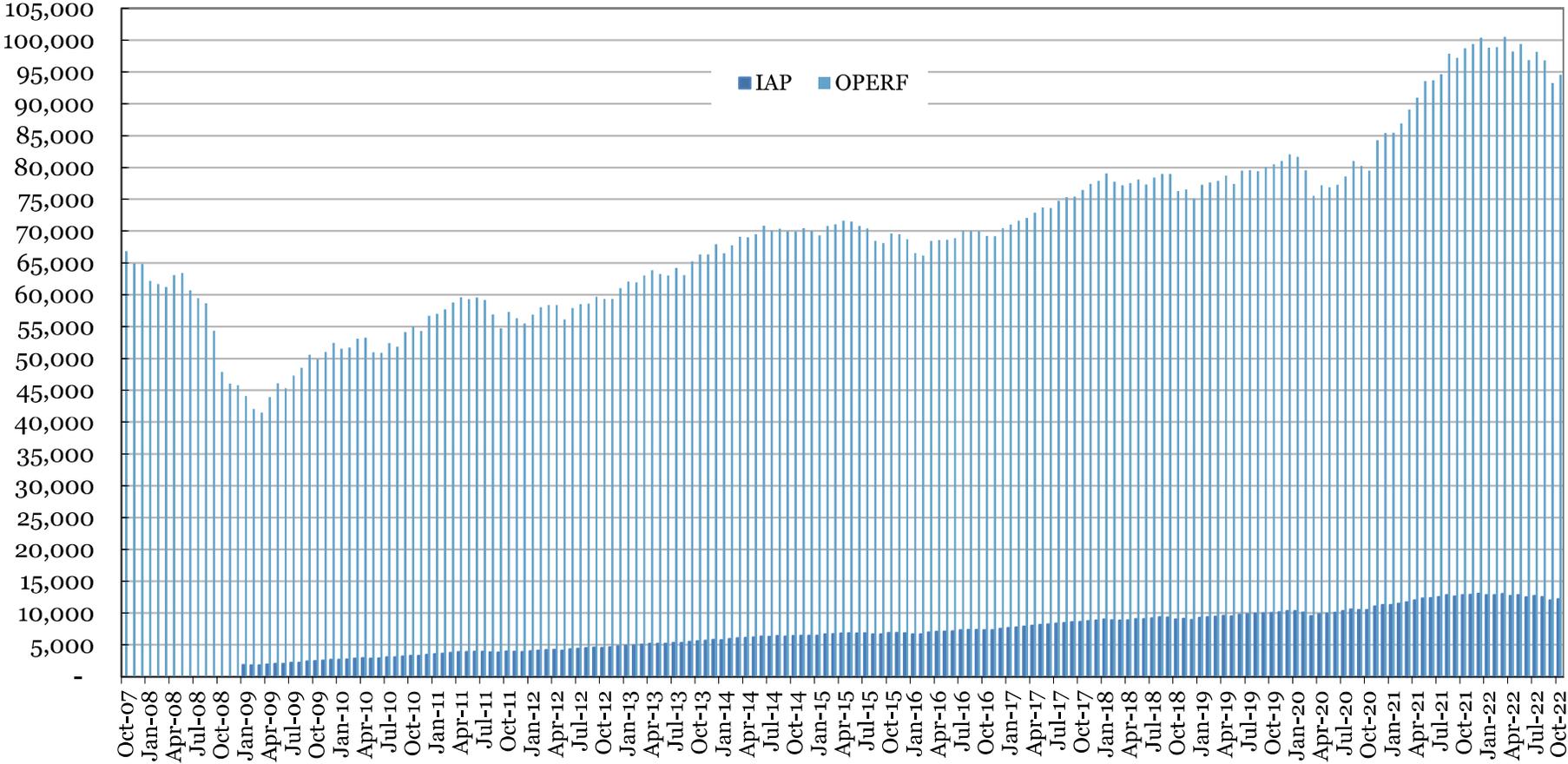
Total of All Treasury Funds**

\$ 130,001,363

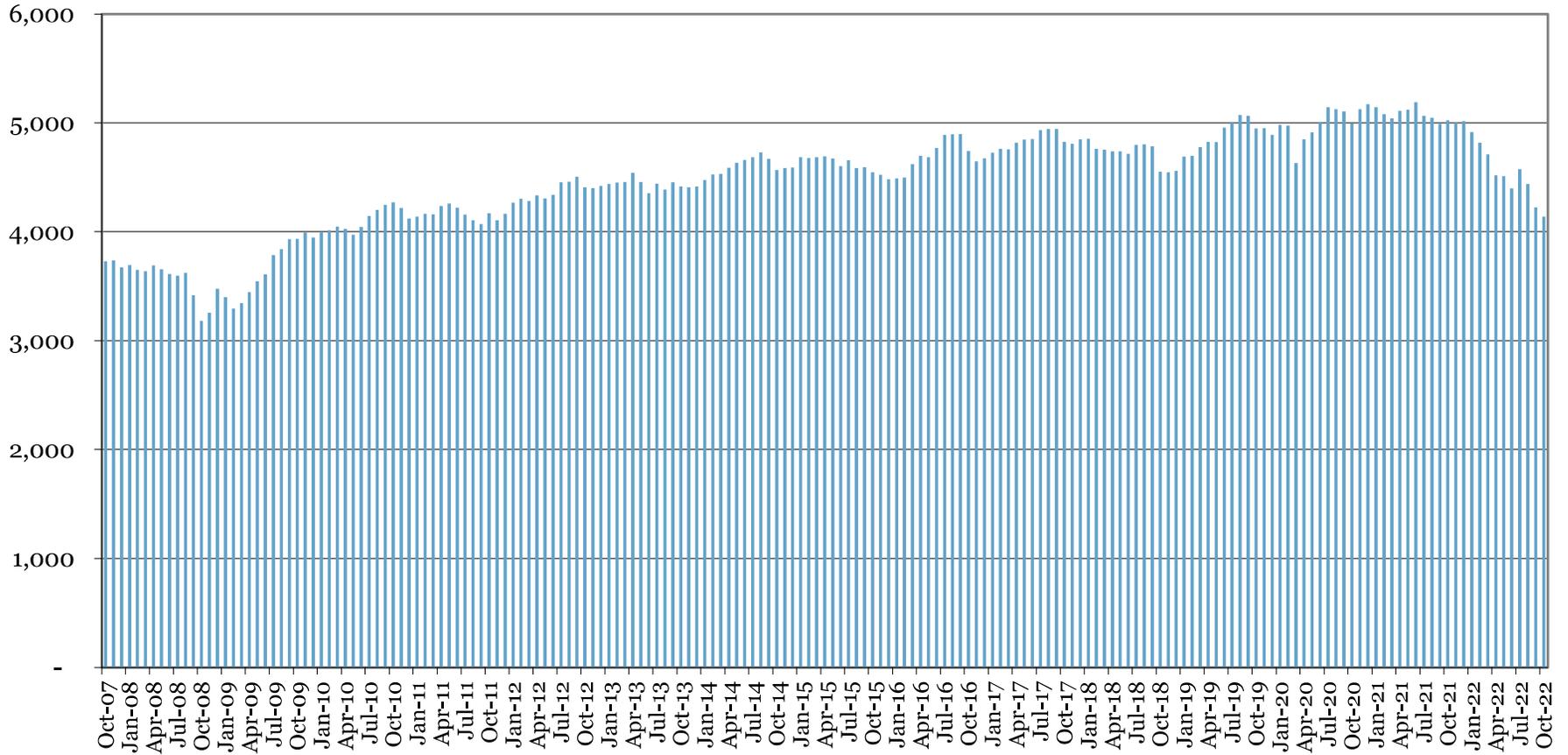


*Other State Funds include DAS Insurance Fund, DCBS Operating Fund, DCBS Workers Benefit Fund, DCBS - Elderly Housing Bond Sinking Fund, DCBS - Other Fund, Oregon Lottery Fund, DVA Bond Sinking Fund, ODOT Fund, OLGIF, & OPUF.

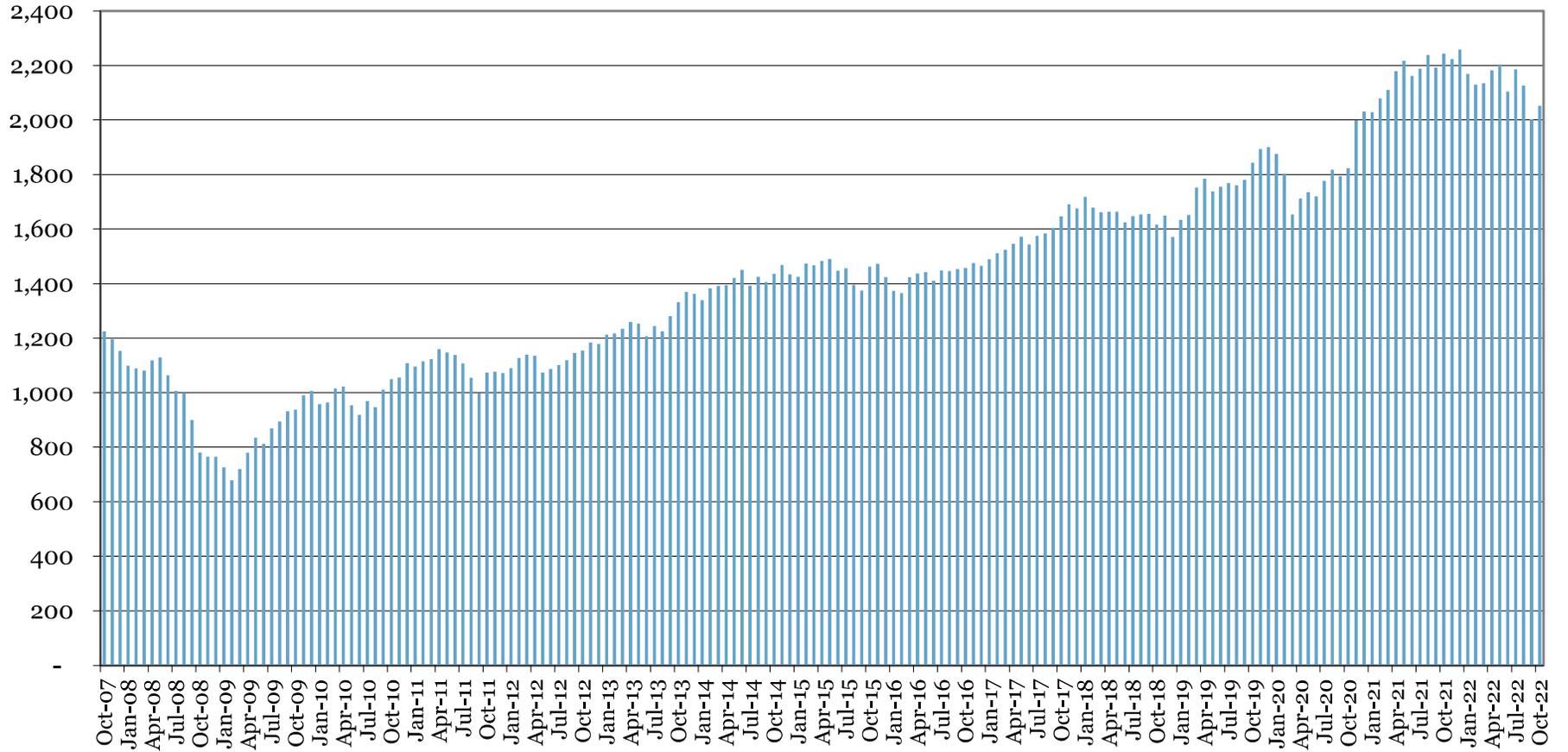
OPERF NAV
15 years ending October 31, 2022
(\$ in Millions)



SAIF NAV
15 years ending October 31, 2022
(\$ in Millions)



CSF NAV
15 years ending October 31, 2022
(\$ in Millions)



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TAB 8

CALENDAR – FUTURE AGENDA ITEMS

2023 OIC Forward Calendar and Planned Agenda Topics

January 25, 2023	Private Equity Portfolio Review Fixed Income Portfolio Review Opportunity Portfolio Review 2024 OIC Calendar Approval
March 8, 2023	Q4 OPERF Performance Individual Account Program (IAP) Review Real Estate Portfolio Review Real Assets Portfolio Review
April 20, 2023	Diversifying Strategies Portfolio Review
May 31, 2023	Q1 OPERF Performance
July 19, 2023	Common School Fund Annual Review
September 6, 2023	Q2 OPERF Performance
October 25, 2023	SAIF Annual Review OSGP Annual Review
December 6, 2023	Q3 OPERF Performance Public Equity Portfolio Review Fixed Income Portfolio Review

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TAB 9
OPEN DISCUSSION



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TAB 10

PUBLIC COMMENTS

Public comments can now be found at the OIC website at:

<https://www.oregon.gov/treasury/invested-for-oregon/pages/oregon-investment-council.aspx>