

October 28, 2020

# Asset Allocation Analysis

Water and Power Employees' Retirement Plan



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# Capital Market Assumption and Asset Allocation Overview



# Capital Markets Assumptions

## Philosophy

- Each year, RVK's general consulting and research teams collaborate to review the capital market environment and update long-term, forward-looking capital market (CM) expectations for each asset class utilized by our clients.
- The forecast horizon is for long-term periods, typically 10 years or more.
- The components we estimate include:
  - Return
  - Risk (volatility of returns)
  - Correlation (relationship of asset class returns with all other asset classes)
- Return assumptions are generally index-based and assume no investment manager alpha.
- Annual updates are typically gradual and incorporate historical performance, current valuations, as well as the overall economic environment.

# What does it mean to get CM Assumptions “right”?

## Relative accuracy is most important...

- **Relative Accuracy:** Assumptions capture the relative relationships between asset classes – particularly closely related ones.
  - Having some assumptions that are spot on and others that are far off will produce unbalanced and poorly diversified portfolios.

## But “absolute” accuracy matters too—just not as much.

- **Absolute Accuracy:** Assumptions reflect the absolute values actually experienced in future long-term market environments.
  - Having CM assumptions that are too high or too low across the board can cause a Fund to believe it can spend more than it can afford or restrict spending more than necessary.

# Themes for 2020 Q1 Capital Market Assumptions

- Past and future inflation levels are studied and considered given market conditions, break-even indications, sovereign intervention, and inflation component pricing behavior. *2020 Q1 assumption is for a 2.0% long-term expected increase.*
- Current valuations are historically correlated to forward returns for public equity markets. *Public equity return expectations have increased as a result of the drawdown experience in the first quarter of 2020.*
- Return decomposition models are run and examined in light of current and possible future market conditions.
- Yield history, current environment, and prospective environments are considered. *US fixed income return assumptions were decreased given the decline in yields.*
- Alternative asset classes are examined for impact from underlying asset classes. *Hedge fund assumptions reflect underlying exposure to asset class trends including equity and fixed income, along with structural characteristics.*

Asset Class	Return Expectation	Rationale
US Equity	↑	Valuations Improving
Non-US Equity	↑	Valuations Improving
Fixed Income	↓	Yields Declining

# Asset Allocation Overview

## Introduction

The selection of the strategic asset allocation is one of the most important decisions that LADWP will make regarding the financial viability of these assets. It is the major determinant of both the long-term rates of return and the volatility of asset values.

Two facets comprise the asset allocation decision:

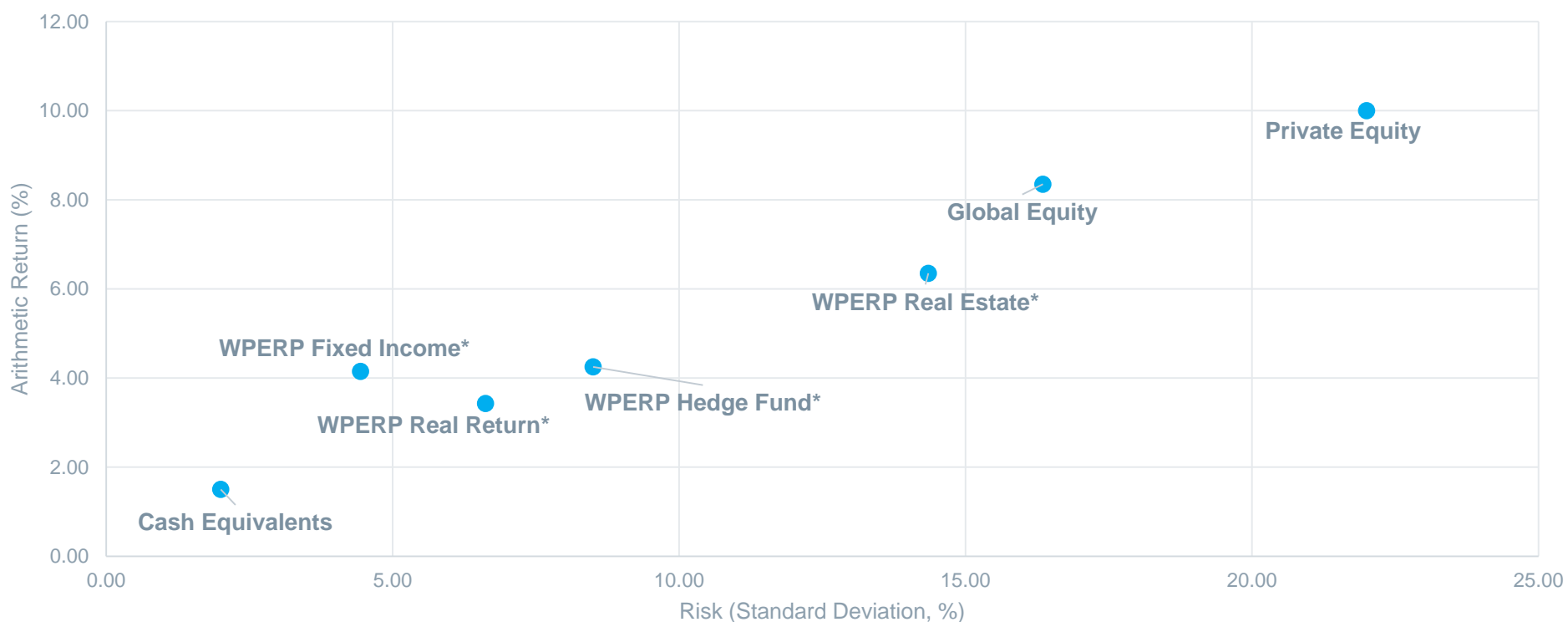
1. Identification of alternative asset allocations to be considered
2. Selection of the asset allocation that best meets the investment objectives

The identification of alternative asset allocations begins with estimating the probable future performance of the various asset classes. Using these projections, we can identify the most desirable alternative allocations (potential portfolios) and evaluate them in light of the investment objectives to select that which is most appropriate.

# Capital Markets Assumptions

## Expected Return and Risk

Asset Class	Arithmetic Return Assumption	Standard Deviation Assumption	Index	Longest Historical Time Frame	Annualized Arithmetic Return	Annual Standard Deviation
Global Equity	8.35	16.35	MSCI ACW IMI (Gross)	Jun 1994 - Mar 2020	6.43	19.49
WPERP Fixed Income*	4.15	4.44	Custom Fixed Income Index	Jan 2004 - Dec 2019	4.77	3.71
WPERP Real Return*	3.43	6.62	Custom Real Return Index	Jan 2003 - Dec 2019	2.18	6.75
WPERP Hedge Fund*	4.25	8.50	HFRI FoF Conservative	Jan 1990 - Dec 2019	5.51	4.85
WPERP Real Estate*	6.35	14.35	NCREIF ODCE (Gross) (AWA)	Jan 1978 - Dec 2019	8.61	9.25
Private Equity	10.00	22.00	Cambridge US Private Equity Index	Apr 1986 - Sep 2019	13.62	12.85
Cash Equivalents	1.50	2.00	BofA ML 3 Mo US T-Bill	Jan 1978 - Mar 2020	4.82	4.06



\*Custom Assumption developed by RVK for the unique WPERP class structure.



# Capital Markets Assumptions

## Correlations

Creating a diversified portfolio of asset classes enables investors to achieve the highest rate of return at a given level of volatility. Diversification exists because the returns of different asset classes do not always move in the same direction at the same time, or with the same magnitude.

Correlation is a quantitative measure of the degree to which asset classes move relative to each other. Correlation values can fall between 1.00 and -1.00.

- **Correlation of 1.00** = returns of both asset classes rise and fall at the same time
- **Correlation of 0.00** = no discernable relationship between the two asset classes
- **Correlation of -1.00** = returns of both asset classes simultaneously move in opposite directions

The fact that the correlations used in this study (below) are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others.

## Correlation Matrix

	Global Equity	WPERP Fixed Income	WPERP Real Return	WPERP Hedge Fund	WPERP Real Estate	Private Equity	Cash Equivalents
Global Equity	1.00	0.58	0.52	0.67	0.32	0.78	-0.06
WPERP Fixed Income	0.58	1.00	0.51	0.43	0.16	0.23	-0.06
WPERP Real Return	0.52	0.51	1.00	0.56	0.22	0.58	0.05
WPERP Hedge Fund	0.67	0.43	0.56	1.00	0.43	0.77	0.18
WPERP Real Estate	0.32	0.16	0.22	0.43	1.00	0.34	0.02
Private Equity	0.78	0.23	0.58	0.77	0.34	1.00	-0.02
Cash Equivalents	-0.06	-0.06	0.05	0.18	0.02	-0.02	1.00

# Efficient Portfolio Illustration

Thematic classification – Represents dedicated manager allocations; as such, thematic allocations are approximations. RVK classifies asset classes as Capital Appreciation, Capital Preservation, Alpha, or Inflation.

We constrain the model to take into account reasonable minimum and maximum allocation to each asset class or groups of asset classes.

The current target portfolio and potential portfolios provided by RVK across the frontier.

	Min	Max	1	2	3	4	5	6	7	8	9	10	Target Allocation	Potential 1	Potential 2
Global Equity	20	80	24	23	30	35	40	47	53	59	65	74	48	47	45
WPERP Fixed Income	10	40	40	40	40	40	39	32	26	20	14	10	25	24	24
WPERP Real Return	0	10	10	10	9	4	0	0	0	0	0	0	5	5	5
WPERP Hedge Fund	0	10	10	6	0	0	0	0	0	0	0	0	5	5	5
WPERP Real Estate	5	10	10	10	10	10	10	10	10	10	10	5	8	9	10
Private Equity	5	10	5	10	10	10	10	10	10	10	10	10	8	9	10
Cash Equivalents	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total			100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			29	33	40	45	50	57	63	69	75	84	56	56	55
Capital Preservation			41	41	41	41	40	33	27	21	15	11	26	25	25
Alpha			10	6	0	0	0	0	0	0	0	0	5	5	5
Inflation			20	20	19	14	10	10	10	10	10	5	13	14	15
<b>Expected Arithmetic Return</b>			<b>5.58</b>	<b>5.84</b>	<b>6.10</b>	<b>6.36</b>	<b>6.62</b>	<b>6.88</b>	<b>7.14</b>	<b>7.41</b>	<b>7.67</b>	<b>7.93</b>	<b>6.75</b>	<b>6.79</b>	<b>6.79</b>
<b>Expected Risk (Standard Deviation)</b>			<b>7.63</b>	<b>8.14</b>	<b>8.71</b>	<b>9.32</b>	<b>10.00</b>	<b>10.82</b>	<b>11.65</b>	<b>12.49</b>	<b>13.33</b>	<b>14.38</b>	<b>10.87</b>	<b>10.93</b>	<b>10.86</b>
<b>Expected Compound Return</b>			<b>5.31</b>	<b>5.53</b>	<b>5.74</b>	<b>5.95</b>	<b>6.15</b>	<b>6.34</b>	<b>6.51</b>	<b>6.69</b>	<b>6.85</b>	<b>6.98</b>	<b>6.20</b>	<b>6.24</b>	<b>6.24</b>
Expected Return (Arithmetic)/Risk Ratio			0.73	0.72	0.70	0.68	0.66	0.64	0.61	0.59	0.58	0.55	0.62	0.62	0.63
RVK Expected Eq Beta (LCUS Eq = 1)			0.41	0.44	0.48	0.52	0.57	0.62	0.67	0.72	0.77	0.84	0.62	0.62	0.62
RVK Liquidity Metric (T-Bills = 100)			74	69	68	68	68	69	70	71	72	76	74	73	71

**Expected Equity Beta** is a measure of sensitivity of a portfolio to the movements of the Large Cap US Equity market. It is a measure of a portfolio's non-diversifiable or systematic risk.

**RVK Liquidity Metric** is a qualitative method for determining the amount of liquidity in a portfolio. The characteristics considered when determining each asset class's relative liquidity include trading volume, gates for redemption, leverage, nature of transactions, and pricing mechanisms.

Range of potential optimal allocations given the selected asset classes and constraints. These ten portfolios generate the efficient frontier line, representing the highest expected return for a given level of risk.

This illustrates the trade off between return and risk; additional return can only be achieved by undertaking additional risk.



# Asset Allocation Analysis



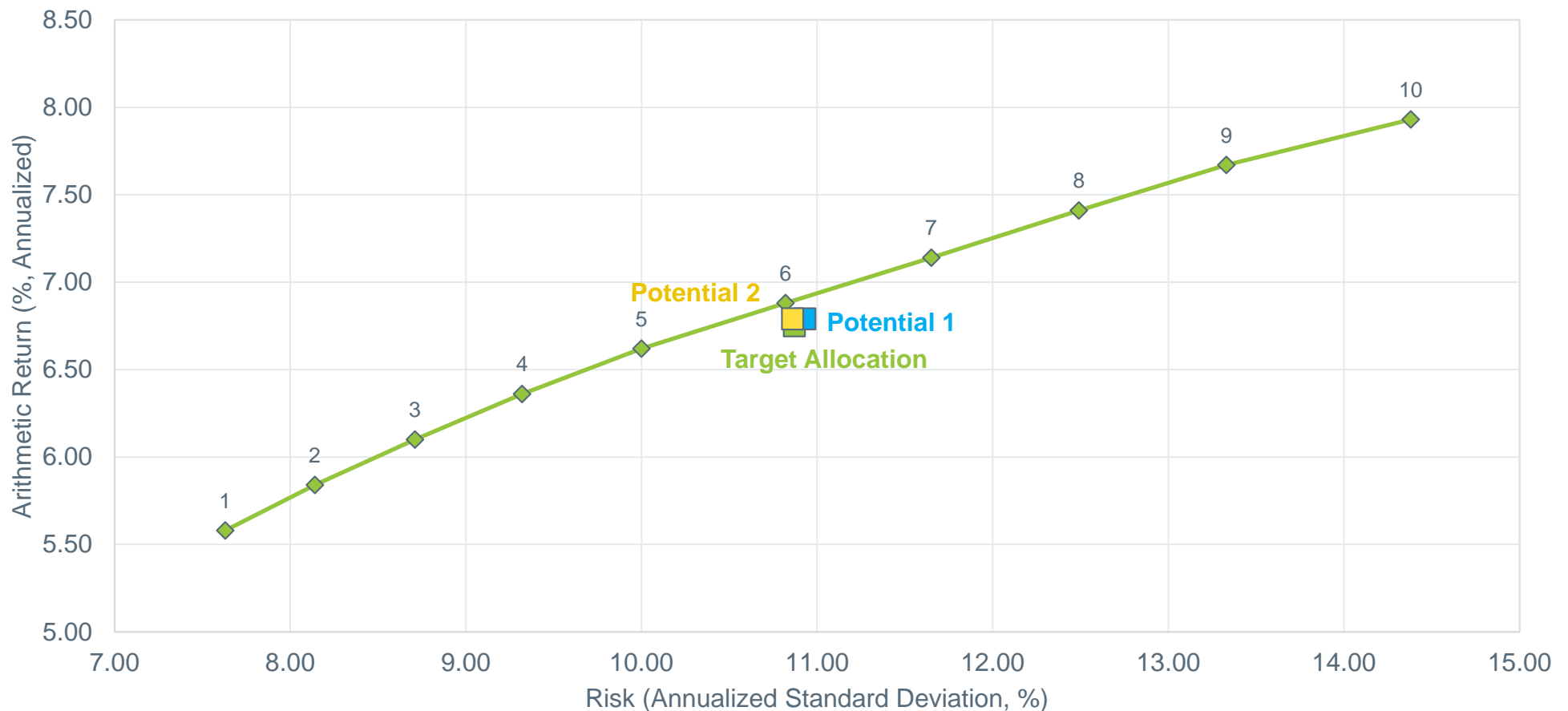
# Efficient Allocations

The table below shows the range of possible optimal allocations given the selected asset classes and constraints listed under “Min” and “Max.” This range illustrates the tradeoff between return and risk; additional return can only be achieved by undertaking additional risk.

	Min	Max	1	2	3	4	5	6	7	8	9	10	Target Allocation	Potential 1	Potential 2
Global Equity	20	80	24	23	30	35	40	47	53	59	65	74	48	47	45
WPERP Fixed Income	10	40	40	40	40	40	39	32	26	20	14	10	25	24	24
WPERP Real Return	0	10	10	10	9	4	0	0	0	0	0	0	5	5	5
WPERP Hedge Fund	0	10	10	6	0	0	0	0	0	0	0	0	5	5	5
WPERP Real Estate	5	10	10	10	10	10	10	10	10	10	10	5	8	9	10
Private Equity	5	10	5	10	10	10	10	10	10	10	10	10	8	9	10
Cash Equivalents	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total			100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			29	33	40	45	50	57	63	69	75	84	56	56	55
Capital Preservation			41	41	41	41	40	33	27	21	15	11	26	25	25
Alpha			10	6	0	0	0	0	0	0	0	0	5	5	5
Inflation			20	20	19	14	10	10	10	10	10	5	13	14	15
<b>Expected Arithmetic Return</b>			<b>5.58</b>	<b>5.84</b>	<b>6.10</b>	<b>6.36</b>	<b>6.62</b>	<b>6.88</b>	<b>7.14</b>	<b>7.41</b>	<b>7.67</b>	<b>7.93</b>	<b>6.75</b>	<b>6.79</b>	<b>6.79</b>
<b>Expected Risk (Standard Deviation)</b>			<b>7.63</b>	<b>8.14</b>	<b>8.71</b>	<b>9.32</b>	<b>10.00</b>	<b>10.82</b>	<b>11.65</b>	<b>12.49</b>	<b>13.33</b>	<b>14.38</b>	<b>10.87</b>	<b>10.93</b>	<b>10.86</b>
<b>Expected Compound Return</b>			<b>5.31</b>	<b>5.53</b>	<b>5.74</b>	<b>5.95</b>	<b>6.15</b>	<b>6.34</b>	<b>6.51</b>	<b>6.69</b>	<b>6.85</b>	<b>6.98</b>	<b>6.20</b>	<b>6.24</b>	<b>6.24</b>
Expected Return (Arithmetic)/Risk Ratio			0.73	0.72	0.70	0.68	0.66	0.64	0.61	0.59	0.58	0.55	0.62	0.62	0.63
RVK Expected Eq Beta (LCUS Eq = 1)			0.41	0.44	0.48	0.52	0.57	0.62	0.67	0.72	0.77	0.84	0.62	0.62	0.62
RVK Liquidity Metric (T-Bills = 100)			74	69	68	68	68	69	70	71	72	76	74	73	71

# Efficient Frontier

The figure below illustrates the relationship between risk and return. The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the "efficient frontier." The upward slope of the efficient frontier indicates the direct relationship between return and risk.



# Monte Carlo Simulation – Return Distribution

The table below shows the expected return by percentile for each portfolio of the Frontier for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Target Allocation	Potential 1	Potential 2
<b>1st Percentile</b>	<b>-17.43</b>	<b>-18.42</b>	<b>-20.63</b>	<b>-22.53</b>	<b>-24.41</b>	<b>-27.04</b>	<b>-29.98</b>	<b>-32.94</b>	<b>-35.70</b>	<b>-39.71</b>	<b>-28.20</b>	<b>-27.79</b>	<b>-26.99</b>
5th Percentile	-6.34	-7.06	-8.17	-9.07	-10.13	-11.52	-12.99	-14.32	-15.72	-17.90	-11.83	-11.71	-11.45
25th Percentile	1.30	1.20	0.87	0.69	0.49	0.11	-0.27	-0.64	-1.04	-1.82	-0.11	-0.03	0.08
<b>50th Percentile</b>	<b>6.00</b>	<b>6.20</b>	<b>6.45</b>	<b>6.67</b>	<b>6.92</b>	<b>7.18</b>	<b>7.44</b>	<b>7.68</b>	<b>7.94</b>	<b>8.21</b>	<b>7.07</b>	<b>7.10</b>	<b>7.12</b>
75th Percentile	10.44	11.01	11.87	12.58	13.43	14.38	15.27	16.19	17.10	18.28	14.26	14.27	14.14
95th Percentile	17.36	18.47	20.35	21.79	23.32	25.27	27.20	29.16	31.11	33.84	25.28	25.28	24.97
99th Percentile	22.59	24.12	26.95	29.07	31.37	34.17	37.00	39.90	42.76	47.08	34.23	34.14	33.74
<b>3 Years</b>													
5th Percentile	-2.23	-2.47	-3.19	-3.71	-4.30	-5.21	-6.12	-7.08	-8.07	-9.67	-5.59	-5.51	-5.19
25th Percentile	2.72	2.73	2.60	2.54	2.43	2.20	2.01	1.81	1.57	1.16	2.04	2.09	2.17
<b>50th Percentile</b>	<b>5.70</b>	<b>5.92</b>	<b>6.14</b>	<b>6.35</b>	<b>6.59</b>	<b>6.80</b>	<b>7.01</b>	<b>7.25</b>	<b>7.43</b>	<b>7.60</b>	<b>6.70</b>	<b>6.72</b>	<b>6.72</b>
75th Percentile	8.46	8.93	9.48	9.97	10.50	11.11	11.70	12.26	12.87	13.59	11.03	11.06	10.98
95th Percentile	12.25	13.02	14.13	15.09	16.10	17.28	18.47	19.68	20.91	22.53	17.28	17.29	17.10
<b>5 Years</b>													
5th Percentile	-0.71	-0.86	-1.36	-1.81	-2.31	-2.95	-3.69	-4.34	-5.16	-6.58	-3.24	-3.17	-2.96
25th Percentile	3.29	3.37	3.29	3.27	3.20	3.07	2.93	2.77	2.59	2.22	2.88	2.95	3.04
<b>50th Percentile</b>	<b>5.63</b>	<b>5.87</b>	<b>6.08</b>	<b>6.30</b>	<b>6.53</b>	<b>6.73</b>	<b>6.91</b>	<b>7.08</b>	<b>7.24</b>	<b>7.36</b>	<b>6.60</b>	<b>6.62</b>	<b>6.63</b>
75th Percentile	7.76	8.18	8.69	9.14	9.60	10.11	10.61	11.08	11.57	12.16	9.99	10.02	9.99
95th Percentile	10.67	11.31	12.24	12.95	13.76	14.70	15.61	16.51	17.43	18.65	14.61	14.64	14.52
<b>10 Years</b>													
5th Percentile	0.84	0.80	0.46	0.24	-0.03	-0.50	-1.01	-1.50	-2.11	-3.30	-0.79	-0.73	-0.56
25th Percentile	3.81	3.92	3.89	3.95	3.97	3.90	3.82	3.74	3.65	3.33	3.72	3.77	3.83
<b>50th Percentile</b>	<b>5.48</b>	<b>5.71</b>	<b>5.90</b>	<b>6.12</b>	<b>6.32</b>	<b>6.50</b>	<b>6.66</b>	<b>6.81</b>	<b>6.96</b>	<b>7.04</b>	<b>6.36</b>	<b>6.40</b>	<b>6.42</b>
75th Percentile	7.06	7.40	7.79	8.16	8.54	8.94	9.33	9.73	10.12	10.53	8.84	8.87	8.84
95th Percentile	9.23	9.74	10.45	11.04	11.65	12.38	13.07	13.79	14.48	15.40	12.28	12.31	12.21

# Summary

- RVK presents the current Target Allocation alongside two Potential target allocations
- The two Potential target allocations offer moderately higher long term expected returns and less severe expected worst case scenario 1 year drawdowns through a decrease in public equities and fixed income in favor of increasing the less liquid real estate and private equity asset classes
- Should the Plan adopt either Potential target allocation, Staff would work with StepStone, the Plan's private equity and real estate consultant, to determine appropriate pacing into the illiquid asset classes

	Min	Max	Target Allocation	Potential 1	Difference vs. Target Allocation	Potential 2	Difference vs. Target Allocation
Global Equity	20	80	48	47	-1	45	-3
WPERP Fixed Income	10	40	25	24	-1	24	-1
WPERP Real Return	0	10	5	5	--	5	--
WPERP Hedge Fund	0	10	5	5	--	5	--
WPERP Real Estate	5	10	8	9	+1	10	+2
Private Equity	5	10	8	9	+1	10	+2
Cash Equivalents	1	1	1	1	--	1	--
Total			100	100	--	100	--
Capital Appreciation			56	56	--	55	-1
Capital Preservation			26	25	-1	25	-1
Alpha			5	5	--	5	--
Inflation			13	14	+1	15	+2
<b>Expected Arithmetic Return</b>			<b>6.75</b>	<b>6.79</b>	<b>+0.04</b>	<b>6.79</b>	<b>+0.04</b>
<b>Expected Risk (Standard Deviation)</b>			<b>10.87</b>	<b>10.93</b>	<b>+0.06</b>	<b>10.86</b>	<b>-0.01</b>
<b>Expected Compound Return</b>			<b>6.20</b>	<b>6.24</b>	<b>+0.04</b>	<b>6.24</b>	<b>+0.04</b>
Expected Return (Arithmetic)/Risk Ratio			0.62	0.62	--	0.63	+0.01
RVK Expected Eq Beta (LCUS Eq = 1)			0.62	0.62	--	0.62	--
RVK Liquidity Metric (T-Bills = 100)			74	73	-1	71	-3
1 Year 1st Percentile Return (Simulated)			-28.20	-27.79	+0.41	-26.99	+1.21
10 Year Median Return (Simulated)			6.36	6.40	+0.04	6.42	+0.06

# Supplemental Information





# Glossary of Asset Allocation Terms

## Definition of Terms

- **Asset Allocation** is a systematic analysis of the properties of specified asset classes to determine the allocation of those assets that meet the return targets of a portfolio.
- **Correlation** is a statistical measure of the relationship between asset class returns. A value of 1.00 is a perfect correlation; that is, the asset classes always move in the same direction. A value of  $-1.00$  indicates a perfect negative correlation, in which the asset classes always move in opposite directions of each other. A value of 0 indicates there is no relationship between the direction of returns of the two asset classes. Correlation calculations only consider the direction of changes relative to two variables and not the magnitude of those changes.
- The **Efficient Frontier** is the set of portfolios that minimizes risk at given target levels of return. This process takes into account the risk, return and correlation of the asset classes to arrive at the most efficient set of portfolios.
- **Expected Equity Beta** is a measure of the sensitivity of a portfolio to movements in the Large/Mid Cap US Equity market. It is a measure of a portfolio's non-diversifiable or systematic risk.
- **Performance Expectation** is the best estimate of the average annual percentage increase in the value of an asset class over the next ten years.
- **Risk** is quantified by the standard deviation of returns. Also known as the volatility of returns, it provides a statistical range of performance relative to the average expectations. With this measure, we can establish a level of "confidence" about the expected range of returns for the portfolios.
- **RVK Liquidity Metric** is a qualitative method for determining the relative amount of liquidity in a portfolio. The characteristics considered when determining relative liquidity include trading volume, gates for redemption, leverage, nature of transactions, and pricing mechanisms. The RVK Liquidity Metric is calculated using investment weights applied to each corresponding asset class liquidity rating.
- **Thematic Classification** represents dedicated manager allocations; as such, thematic allocations are approximations. RVK categorizes asset classes as Alpha, Capital Appreciation, Capital Preservation, and Inflation.

PORTLAND

BOISE

CHICAGO

NEW YORK

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