

# AHIC Capital Market Assumptions

## Explanation of Capital Market Assumptions—Q1 20XX

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SAMPLE REPORT

- **Private Equity (6.1%)** – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.
- **Infrastructure (4.0%)** – 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 4.0% for infrastructure.
- **Equity Risk Insurance Premium Strategies- Low Beta (3.5%)** – We assume nominal returns from cash of 2.4% + 3.5% from alpha.

### 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.



## Appendix

- Horizon Survey of Capital Market Assumptions



# 20XX Horizon Survey Results

## AHIC vs. Other Advisors

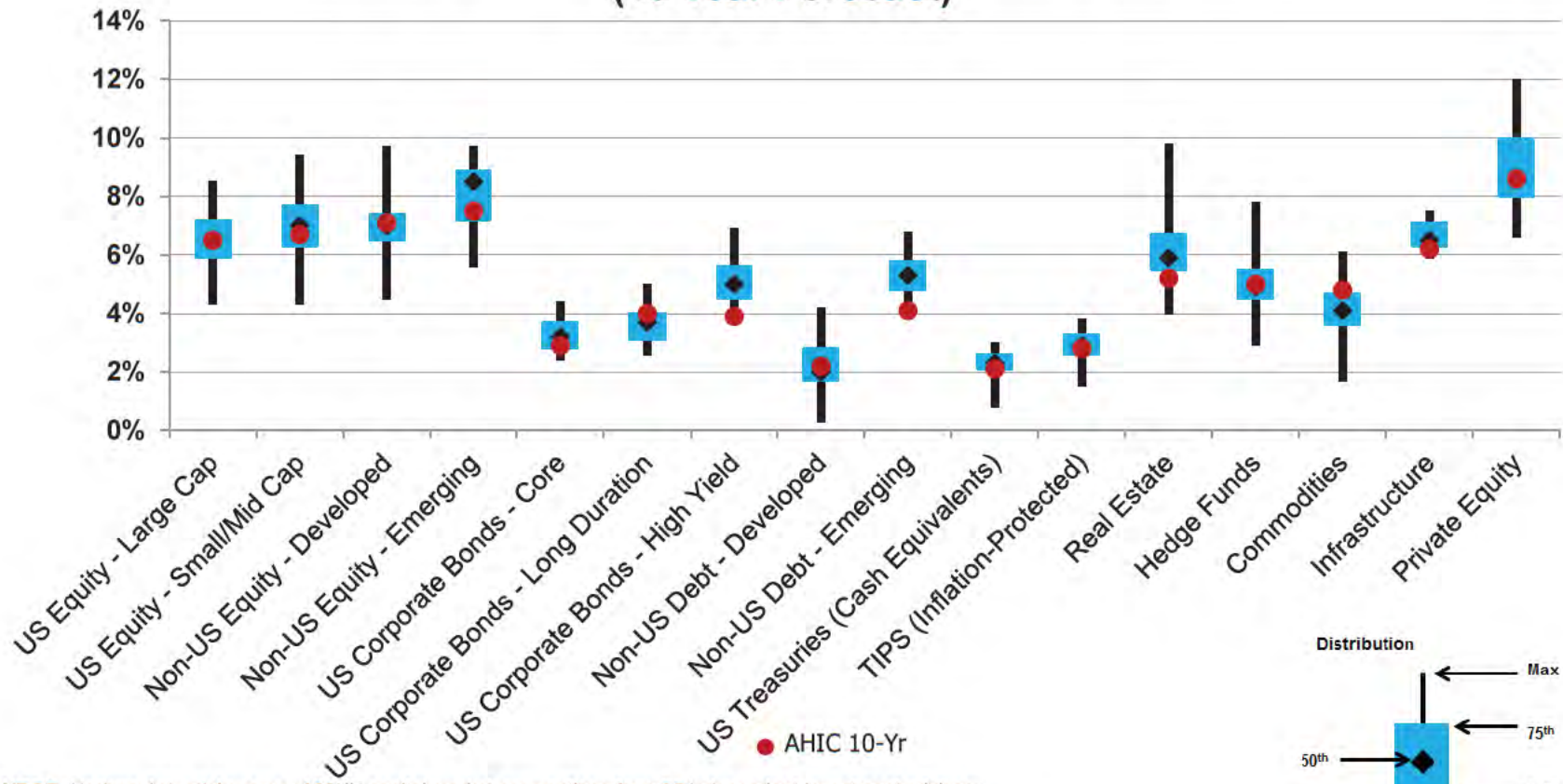
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### SAMPLE REPORT

- Since 20XX, Horizon Actuarial Services, LLC has conducted a capital market assumption survey of investment firms to aid in determining reasonable assumptions for a pension plan's expected return on assets
  - While we do not seek to change our approach based on how we stack up to peers, it is a helpful double-check to make sure we are not too far off from others in the industry
- Compared to 20XX, the 20XX survey results under the 10-year forecast indicate a slight decrease in return assumptions for both risky assets (equity-like) and fixed income asset classes
  - Equity return assumptions are lower by an average of 0.2%
  - Fixed income return assumptions are lower by an average of 0.3%
  - Alternative asset class return assumptions are lower by an average of 0.1%
- 20XX AHIC 10-year forecast assumptions tend to be lower than the survey average
  - AHIC equity assumptions are driven by market valuations, earnings growth expectations and assumed payouts to investors. Recent experience suggests strong equity market performance has been driven more by increasing valuations than increasing profits. As markets have become more expensive, our equity return assumptions have consequently fallen
  - AHIC fixed income assumptions reflect falling yields and flattening of yield curves during the first quarter of 20XX
  - AHIC alternative asset class assumptions are generally lower due to methodological and inflation forecast differences compared to survey participant forecasts
- In conclusion, AHIC assumptions appear somewhat more conservative than peers included in the 20XX Horizon Survey of capital market assumptions

# Ask 35 Consultants and...

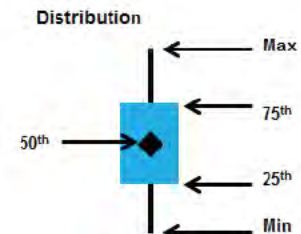
## Expected Geometric Returns by Asset Class (10 Year Forecast)



**SOURCE:** Horizon Actuarial survey of 20XX capital market assumptions from 35 independent investment advisors  
Expected returns of the survey are annualized over 10-years (geometric).  
AHIC expected returns are annualized over 10-years as of 2Q 20XX

Expected returns are using AHIC 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. See capital market assumptions disclosure pages beginning on page 33.

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## AHIC Versus Peers (20XX Horizon Survey)—10-Year Forecast

Asset Class	Horizon Survey		AHIC		Difference
	10 Year Horizon		10 Year Forecasts		
	Expected Return	Expected Risk	Expected Return	Expected Risk	
US Equity - Large Cap	6.5%	16.6%	6.5%	17.0%	0.0%
US Equity - Small/Mid Cap	6.9%	20.2%	6.7%	23.0%	-0.2%
Non-US Equity - Developed	7.0%	18.9%	7.1%	20.0%	0.1%
Non-US Equity - Emerging	8.0%	25.4%	7.5%	30.0%	-0.5%
US Fixed Income - Core	3.2%	5.5%	2.9%	4.0%	-0.3%
US Fixed Income - Long Duration Corp	3.6%	10.4%	4.0%	11.0%	0.4%
US Fixed Income - High Yield	5.1%	10.6%	3.9%	12.0%	-1.2%
Non-US Fixed Income - Developed	2.2%	7.4%	2.2%	5.5%	0.0%
Non-US Fixed Income - Emerging	5.3%	11.8%	4.1%	13.0%	-1.2%
Treasuries (Cash Equivalents)	2.3%	3.0%	2.1%	1.0%	-0.2%
TIPS (Inflation-Protected)	2.9%	6.3%	2.8%	4.5%	-0.1%
Real Estate	6.2%	14.5%	5.2%	11.5%	-1.0%
Hedge Funds	4.9%	8.0%	5.0%	9.0%	0.1%
Commodities	4.1%	17.9%	4.8%	17.0%	0.8%
Infrastructure	6.7%	14.6%	6.2%	14.5%	-0.5%
Private Equity	9.0%	22.0%	8.6%	24.0%	-0.4%
Inflation	2.2%	1.7%	2.2%	1.0%	0.0%

### Notes (Horizon Survey):

Source: Horizon Actuarial survey of 20XX capital market assumptions from 35 independent investment advisors

Expected returns are annualized (geometric).

### Notes (AHIC Forecasts):

AHIC Forecasts are for Q2 20XX

US Equity - Small/Mid Cap forecasts represents AHIC forecasts for US Small Cap

US Fixed Income - Long Duration forecasts represents AHIC forecasts for Long Duration Credit

Non-US Fixed Income - Developed forecasts represents AHIC forecasts for Non-US Fixed Income - Developed (50% Hedged)

Non-US Fixed Income- Emerging forecasts represents AHIC forecasts for Non-US Fixed Income- Emerging Sovereign USD

Real Estate forecasts represents AHIC forecasts for Core Private Real Estate

Hedge Funds forecasts represents AHIC forecasts for Hedge Fund-of-Funds (Buy List)

Expected returns are using AHIC 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. See capital market assumptions disclosure pages beginning on page 33.

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## Leading Methodologies & Reasons for Differences

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### Leading Methodologies

- Building Block
- Global Capital Asset Pricing Model (Global CAPM)
- Surveys
- Historical data (as a guide to future)
- Black-Litterman (combination of building block and CAPM)

### Reasons for Differences

- Methodology
- Time Horizon
- Arithmetic vs. Geometric forecasts\*
- Alpha (active management)\*
- Inflation
- Investment Fees
- Asset class definition

\* While some firms in Horizon survey responded with Arithmetic forecasts, the results have been converted to Geometric forecasts for comparison purposes. Additionally, the return expectations included in the Horizon survey are based on indexed returns (no "alpha"). However, AHIC return assumptions for certain asset classes include "alpha" or active management premium (e.g., Hedge Funds)

- Liquidity Analysis Detail

## Background

### AHIC Approach to Analyzing Liquidity Risk from Alternatives

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- 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

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SAMPLE REPORT



Case ID: 210601197

## Background

### Modeling Parameters – Degrees of Illiquidity

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SAMPLE REPORT

- We categorized investments by liquidity into four buckets
  - **Liquid:** 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 Black Skies scenario (e.g. many hedge funds, core real estate)
  - **Illiquid: Potential lock-up of 5–10 years**, depending on economic environment (e.g. closed-ended real estate)
  - **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
- We started with the current long-term target allocation, then see how the actual allocations would change in different economic scenarios, continuing new commitments to private assets, as expected.
- Assumptions
  - Starting assets based the June 30, 20XX actuarial valuation report
  - Asset figures reflect actual returns of 7.8% for the period July 1, 20XX – December 31, 20XX
  - The plan's contribution policy is actuarially based, leveraging projections from the plan actuary based on the 20XX asset-liability study
  - Assumes the portfolio starts at the target asset allocation levels for illiquid assets, maintaining close to the long-term policy targets over the next 10 years

Case ID: 210601197

## Background

### Asset Allocation and Liquidity Category (Current Policy)

SAMPLE REPORT

Asset Class	Target Allocations				
	Total portfolio	Liquid	Quasi-Liquid	Illiquid: 5-10 Years	Illiquid: 10+ Years
Public Equities	45.0%	45.0%	0.0%	0.0%	0.0%
Opportunistic Allocation	8.0%	8.0%	0.0%	0.0%	0.0%
Core Real Estate	9.0%	0.0%	9.0%	0.0%	0.0%
Real Assets	6.0%	0.0%	0.0%	0.0%	6.0%
Private Equity	8.0%	0.0%	0.0%	0.0%	8.0%
High Yield Bonds	6.0%	6.0%	0.0%	0.0%	0.0%
Intermediate Aggregate Fixed Income	18.0%	18.0%	0.0%	0.0%	0.0%
<b>Total</b>	<b>100.0%</b>	<b>77.0%</b>	<b>9.0%</b>	<b>0.0%</b>	<b>14.0%</b>

Case ID: 210601197



## Background Economic Scenarios

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SAMPLE REPORT

- **Base Scenario**
  - Markets perform as expected (~50th percentile)
- **Recession Scenario**
  - Somewhat pessimistic outlook for the markets (~95<sup>th</sup> percentile)
  - Return-seeking assets decline in the first two years with a modest rebound in later years.
- **Black Skies Scenario**
  - Very pessimistic outlook for markets (~99th percentile)
  - Return-seeking assets decline significantly. The value of public equities roughly splits in half over three years, without an immediate rebound

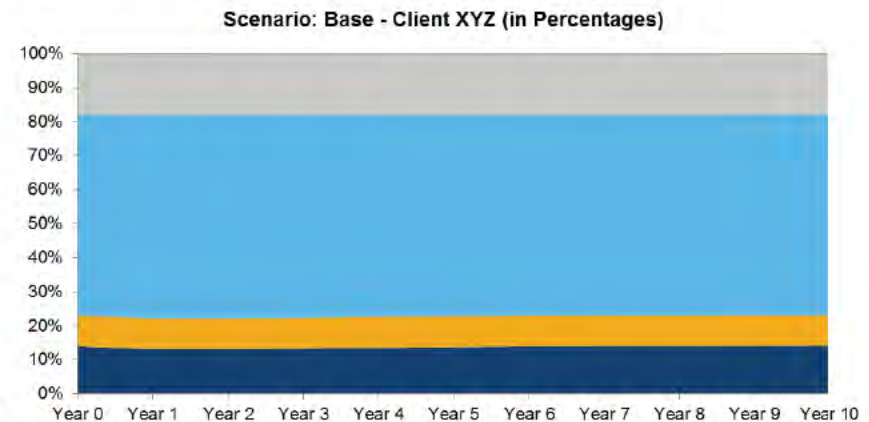
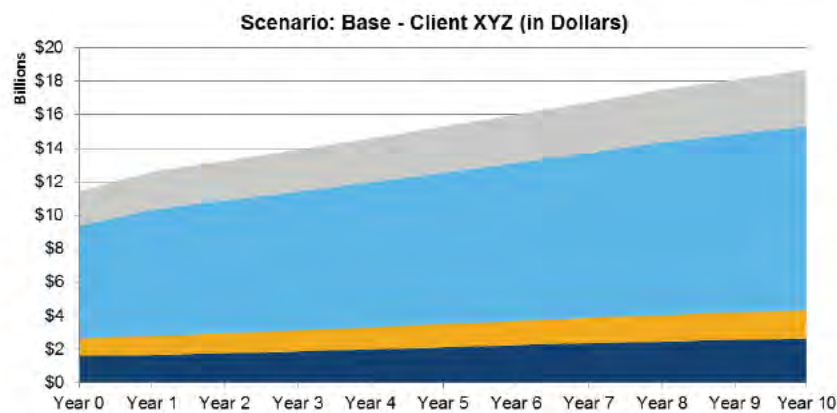
# Liquidity Analysis: Base Economic Scenario

## Current Policy

SAMPLE REPORT

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

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid ■ Risk-Reducing Assets



- Key Takeaway:**
  - Total illiquid assets stay near 23% of the plan and can be maintained near the target with no cash flow problems

## Liquidity Analysis: Base Economic Scenario (continued)

### Current Policy

SAMPLE REPORT

- The exhibit below shows the projected liquidity lock-up of the current allocation in a Base scenario

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Risk-Reducing Assets	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Liquid Return-Seeking	59	60	60	60	59	59	59	59	59	59	59
<b>Total Liquid</b>	<b>77%</b>	<b>78%</b>	<b>78%</b>	<b>78%</b>	<b>77%</b>	<b>77%</b>	<b>77%</b>	<b>77%</b>	<b>77%</b>	<b>77%</b>	<b>77%</b>
Quasi-Liquid	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Illiquid: 5-10 Year Lock-up	0	0	0	0	0	0	0	0	0	0	0
Illiquid: 10+ Year Lock-up	14	13	13	13	14	14	14	14	14	14	14
<b>Total Quasi + Illiquid</b>	<b>23%</b>	<b>22%</b>	<b>22%</b>	<b>22%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>	<b>23%</b>



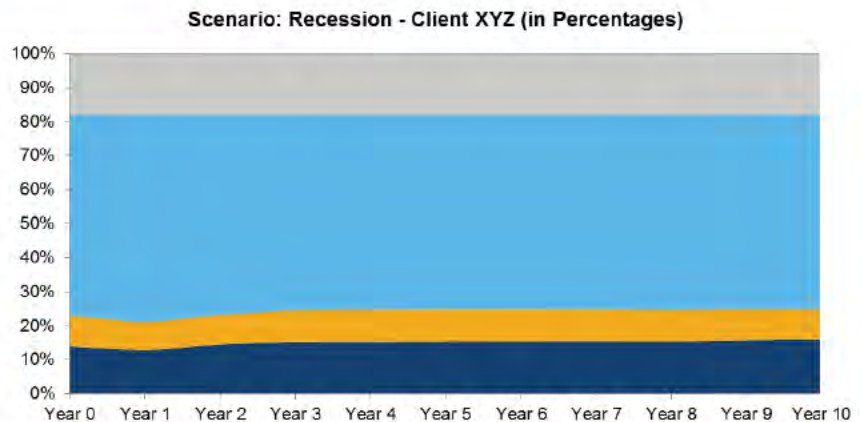
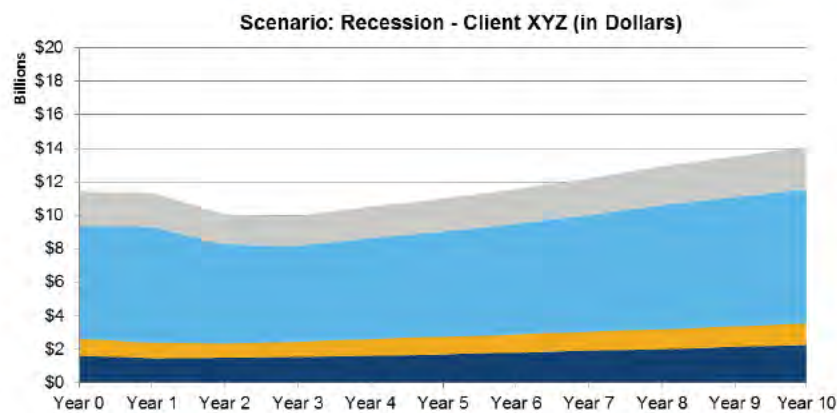
# Liquidity Analysis: Recession Economic Scenario

## Current Policy

SAMPLE REPORT

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

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid ■ Risk-Reducing Assets



- Key Takeaways:**
  - Commitments to illiquid alternatives are maintained at the steady state level, but recessionary markets cause the total portfolio to shrink
  - Total illiquid assets reach about 20% 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

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# Liquidity Analysis: Recession Economic Scenario (continued)

## Current Policy

SAMPLE REPORT

- The exhibit below shows the projected liquidity lock-up of the current allocation in a Recession scenario

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Risk-Reducing Assets	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Liquid Return-Seeking	59	61	59	57	57	57	57	57	57	57	57
<b>Total Liquid</b>	<b>77%</b>	<b>79%</b>	<b>77%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>	<b>75%</b>
Quasi-Liquid	9%	8%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Illiquid: 5-10 Year Lock-up	0	0	0	0	0	0	0	0	0	0	0
Illiquid: 10+ Year Lock-up	14	13	15	15	15	15	15	16	15	16	16
<b>Total Quasi + Illiquid</b>	<b>23%</b>	<b>21%</b>	<b>23%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>	<b>25%</b>

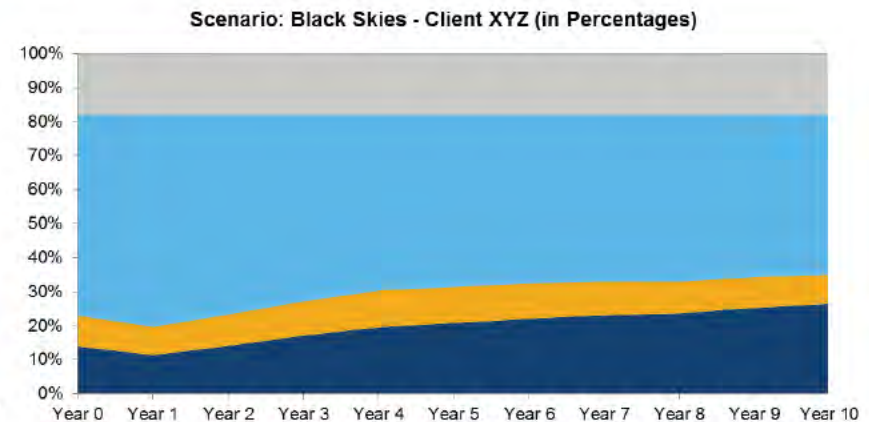
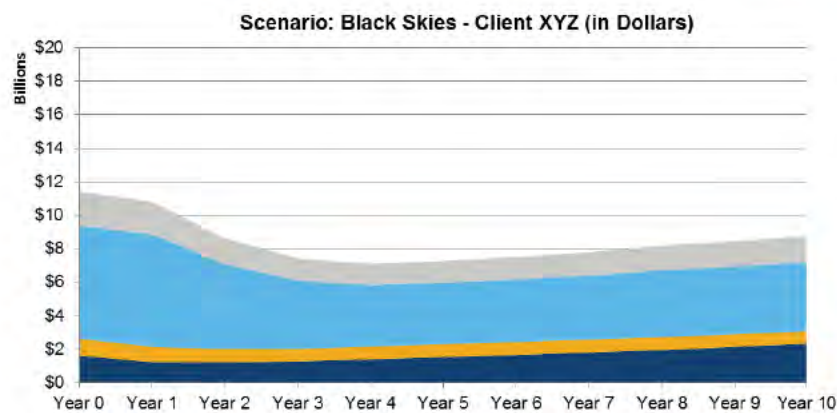
# Liquidity Analysis: Black Skies Economic Scenario

## Current Policy

SAMPLE REPORT

- The exhibit below shows the projected liquidity lock-up of the current allocation in a Black Skies scenario, assuming commitments are continued as expected

■ Illiquid: 10+ Years ■ Illiquid: 5-10 Years ■ Quasi-Liquid ■ Liquid ■ Risk-Reducing Assets



### Key Takeaways:

- Commitments to illiquid alternatives are maintained at the steady state level, but subpar markets cause the total portfolio to shrink
- Total illiquid assets reach as high as 35% 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

Case ID: 210601197



# Liquidity Analysis: Black Skies Economic Scenario (continued)

## Current Policy

SAMPLE REPORT

- The exhibit below shows the projected liquidity lock-up of the current strategy in a Black Skies scenario

Asset Allocation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Risk-Reducing Assets	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Liquid Return-Seeking	59	62	59	55	52	51	50	49	49	48	47
<b>Total Liquid</b>	<b>77%</b>	<b>80%</b>	<b>77%</b>	<b>73%</b>	<b>70%</b>	<b>69%</b>	<b>68%</b>	<b>67%</b>	<b>67%</b>	<b>66%</b>	<b>65%</b>
Quasi-Liquid	9%	8%	9%	10%	11%	11%	10%	10%	9%	9%	9%
Illiquid: 5-10 Year Lock-up	0	0	0	0	0	0	0	0	0	0	0
Illiquid: 10+ Year Lock-up	14	11	14	17	20	21	22	23	24	25	26
<b>Total Quasi + Illiquid</b>	<b>23%</b>	<b>20%</b>	<b>23%</b>	<b>27%</b>	<b>30%</b>	<b>31%</b>	<b>32%</b>	<b>33%</b>	<b>33%</b>	<b>34%</b>	<b>35%</b>

## Economic Scenarios – Base

### BASE SCENARIO

	Year 0	1	2	3	4	5	6	7	8	9	10
<b>Yields (BOY)</b>											
Treasury yield 5y	2.1%	2.4%	2.6%	2.7%	2.8%	2.8%	2.9%	2.9%	3.0%	3.2%	3.3%
Long Treasury yield 15y	2.7%	2.8%	2.9%	2.9%	3.0%	3.1%	3.1%	3.1%	3.2%	3.2%	3.2%
TIPS yield 5y	0.2%	0.3%	0.6%	0.8%	0.9%	1.1%	1.1%	1.1%	1.1%	1.1%	1.0%
Long TIPS yield 15y	0.7%	0.8%	0.9%	1.0%	1.0%	1.1%	1.1%	1.2%	1.2%	1.2%	1.2%
Breakeven price inflation 15y	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%	1.9%	2.0%	2.0%	2.1%
A Corporate bond yield 5y	2.8%	3.2%	3.6%	3.9%	4.2%	4.3%	4.3%	4.3%	4.2%	4.2%	4.2%
Long A Corporate bond yield 10y	3.5%	3.8%	3.9%	4.1%	4.2%	4.2%	4.3%	4.4%	4.5%	4.6%	4.7%
A Corporate spread 5y	0.6%	0.8%	1.0%	1.2%	1.3%	1.4%	1.4%	1.3%	1.2%	1.0%	0.9%
Long A Corporate spread 10y	1.0%	1.1%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.4%	1.4%	1.5%
<b>Expected nominal return on assets</b>											
Equity - US		6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%
Equity - Global		7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%
A Corporate bonds 5y		1.7%	2.0%	2.5%	3.0%	3.4%	3.7%	3.9%	4.0%	4.1%	4.1%
Long A Corporate bonds 10y		1.6%	1.9%	2.5%	3.0%	3.4%	3.7%	3.9%	4.1%	4.1%	4.0%
Treasury 5y		1.5%	1.8%	2.1%	2.5%	2.8%	2.8%	2.8%	2.9%	2.7%	2.9%
Long Treasury 15y		1.5%	1.8%	2.1%	2.5%	2.8%	2.8%	2.8%	2.9%	2.7%	2.9%
TIPS 5y		2.0%	2.0%	2.3%	2.6%	2.8%	3.0%	3.2%	3.3%	3.4%	3.4%
Long TIPS 15y		2.0%	2.0%	2.3%	2.6%	2.8%	3.0%	3.2%	3.3%	3.4%	3.4%
US High Yield		4.9%	4.0%	3.8%	4.1%	4.5%	4.1%	4.3%	4.7%	4.5%	4.7%
Bank Loans		3.6%	3.8%	4.4%	4.4%	4.4%	4.7%	4.5%	4.5%	4.6%	4.7%
USD Emerging Market Debt		3.7%	3.4%	4.0%	4.1%	4.6%	4.7%	4.8%	5.1%	4.9%	5.1%
Local Emerging Market Debt		5.1%	5.6%	5.8%	5.4%	5.9%	5.6%	5.8%	5.7%	6.3%	5.8%
Real Estate		5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%
Commodities		4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Hedge Funds - FoHF - Universe		3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%
Private Equity		8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%
Infrastructure - Europe		6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Cash		1.5%	1.8%	2.1%	2.5%	2.8%	2.8%	2.8%	2.9%	2.7%	2.9%
CPI		2.1%	2.1%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%

Scenario information as of September 30, 20XX

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## Economic Scenarios – Recession

### RECESSION SCENARIO

	Year 0	1	2	3	4	5	6	7	8	9	10
<b>Yields (BOY)</b>											
Treasury yield 5y	2.1%	1.4%	1.1%	1.3%	1.7%	2.2%	2.2%	2.3%	2.4%	2.5%	2.6%
Long Treasury yield 15y	2.7%	2.1%	1.7%	1.8%	2.0%	2.5%	2.5%	2.5%	2.6%	2.6%	2.7%
TIPS yield 5y	0.2%	-0.3%	-0.3%	0.0%	0.4%	0.8%	0.9%	0.9%	0.9%	0.8%	0.8%
Long TIPS yield 15y	0.7%	0.4%	0.4%	0.3%	0.6%	0.7%	0.8%	0.8%	0.8%	0.8%	0.8%
Breakeven price inflation 15y	2.0%	1.7%	1.3%	1.4%	1.4%	1.8%	1.7%	1.7%	1.8%	1.8%	1.8%
A Corporate bond yield 5y	2.8%	4.2%	4.8%	4.9%	5.2%	5.3%	5.4%	5.3%	5.3%	5.2%	5.2%
Long A Corporate bond yield 10y	3.5%	4.5%	4.8%	4.8%	4.9%	4.9%	5.0%	5.1%	5.2%	5.3%	5.4%
A Corporate spread 5y	0.6%	2.8%	3.7%	3.6%	3.5%	3.1%	3.1%	3.0%	2.9%	2.7%	2.6%
Long A Corporate spread 10y	1.0%	2.8%	3.4%	3.3%	3.0%	2.6%	2.6%	2.7%	2.8%	2.9%	2.9%
<b>Expected nominal return on assets</b>											
Equity - US	-18.1%	-10.0%	10.6%	5.7%	5.7%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%
Equity - Global	-21.5%	-12.0%	11.6%	5.9%	5.9%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%
A Corporate bonds 5y	-2.2%	1.1%	2.9%	2.3%	3.1%	3.5%	3.7%	3.9%	4.0%	4.0%	4.0%
Long A Corporate bonds 10y	-5.2%	0.5%	3.1%	2.2%	2.4%	3.0%	3.2%	3.3%	3.3%	3.3%	3.2%
Treasury 5y	5.6%	2.9%	0.5%	-0.2%	0.0%	2.3%	2.3%	2.4%	2.3%	2.3%	2.4%
Long Treasury 15y	12.6%	9.3%	0.9%	-1.8%	-3.7%	2.2%	2.2%	2.3%	2.1%	2.1%	2.3%
TIPS 5y	2.3%	0.3%	-0.7%	-0.4%	-0.1%	1.4%	1.6%	1.8%	1.9%	1.9%	1.9%
Long TIPS 15y	5.2%	2.7%	1.5%	-1.9%	0.0%	1.6%	1.8%	1.9%	2.0%	2.0%	2.0%
US High Yield	-12.4%	-6.5%	6.9%	3.5%	3.7%	3.0%	3.1%	3.5%	3.4%	3.4%	3.6%
Bank Loans	-6.7%	-2.8%	5.3%	3.4%	3.4%	3.3%	3.1%	3.1%	3.2%	3.2%	3.3%
USD Emerging Market Debt	-18.0%	-10.2%	7.7%	3.2%	3.9%	3.7%	3.8%	4.1%	3.9%	4.1%	4.1%
Local Emerging Market Debt	-19.0%	-9.6%	9.9%	4.4%	5.1%	4.5%	4.7%	4.6%	5.2%	4.7%	4.7%
Real Estate	-12.6%	-7.5%	-2.3%	1.1%	5.0%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Commodities	-27.6%	-21.7%	7.3%	3.9%	3.9%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Hedge Funds - FoHF - Universe	-14.2%	-9.0%	6.5%	5.4%	3.6%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Private Equity	-18.5%	-6.0%	13.5%	8.7%	8.9%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Infrastructure - Europe	-6.2%	-1.8%	1.7%	2.5%	6.1%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%
Cash	1.5%	0.6%	0.5%	0.7%	1.2%	1.2%	1.2%	1.3%	1.2%	1.2%	1.3%
CPI	-0.4%	0.4%	0.7%	1.0%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%

Scenario information as of September 30, 20XX

Expected returns are using AHIC 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. See capital market assumptions disclosure pages beginning on page 33.

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## Economic Scenarios – Black Skies

### BLACK SKIES SCENARIO

	Year 0	1	2	3	4	5	6	7	8	9	10
<b>Yields (BOY)</b>											
Treasury yield 5y	2.1%	0.6%	0.6%	0.7%	0.8%	0.9%	0.9%	1.0%	1.1%	1.2%	1.3%
Long Treasury yield 15y	2.7%	1.5%	1.1%	1.1%	1.2%	1.4%	1.4%	1.4%	1.5%	1.5%	1.6%
TIPS yield 5y	0.2%	-0.3%	-0.4%	-0.3%	-0.2%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%
Long TIPS yield 15y	0.7%	0.2%	0.2%	0.1%	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%
Breakeven price inflation 15y	2.0%	1.3%	1.0%	0.9%	0.9%	1.1%	1.0%	1.0%	1.1%	1.1%	1.1%
A Corporate bond yield 5y	2.8%	4.4%	5.5%	5.6%	5.7%	5.4%	5.5%	5.4%	5.4%	5.3%	5.3%
Long A Corporate bond yield 10y	3.5%	4.7%	5.3%	5.2%	5.1%	4.9%	5.0%	5.1%	5.2%	5.3%	5.4%
A Corporate spread 5y	0.6%	3.8%	4.9%	5.0%	4.9%	4.5%	4.5%	4.5%	4.3%	4.1%	4.0%
Long A Corporate spread 10y	1.0%	3.6%	4.4%	4.4%	4.2%	3.8%	3.8%	3.9%	4.0%	4.0%	4.1%
<b>Expected nominal return on assets</b>											
Equity - US	-28.8%	-20.8%	-11.5%	2.6%	2.6%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Equity - Global	-32.5%	-23.6%	-13.0%	2.5%	2.5%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
A Corporate bonds 5y	-3.3%	-2.4%	1.2%	1.4%	2.5%	1.3%	1.5%	1.7%	1.9%	2.0%	2.0%
Long A Corporate bonds 10y	-7.1%	-4.4%	1.1%	1.5%	2.9%	0.6%	0.8%	0.9%	0.8%	0.7%	0.7%
Treasury 5y	8.7%	0.9%	0.3%	0.3%	0.4%	1.1%	1.0%	1.1%	1.0%	1.1%	1.1%
Long Treasury 15y	22.5%	8.1%	2.6%	-0.2%	-0.9%	1.4%	1.3%	1.5%	1.3%	1.5%	1.5%
TIPS 5y	0.5%	-1.1%	-0.2%	-0.2%	0.0%	0.3%	0.4%	0.6%	0.7%	0.7%	0.7%
Long TIPS 15y	6.6%	0.7%	0.7%	-0.6%	-0.3%	0.6%	0.8%	0.9%	1.0%	1.0%	1.0%
US High Yield	-26.8%	-20.5%	-12.0%	0.7%	1.2%	-0.8%	-0.7%	-0.3%	-0.4%	-0.2%	-0.2%
Bank Loans	-17.0%	-12.4%	-6.5%	1.4%	1.4%	0.1%	0.0%	0.0%	0.1%	0.2%	0.2%
USD Emerging Market Debt	-26.7%	-20.3%	-11.1%	0.6%	1.2%	-0.3%	-0.3%	0.1%	-0.1%	0.1%	0.1%
Local Emerging Market Debt	-28.8%	-20.8%	-11.0%	1.5%	2.1%	0.0%	0.2%	0.1%	0.7%	0.2%	0.2%
Real Estate	-15.2%	-10.7%	-4.8%	-0.3%	2.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Commodities	-36.7%	-28.3%	-3.6%	2.3%	2.3%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Hedge Funds - FoHF - Universe	-18.1%	-12.7%	-6.8%	0.5%	0.5%	-1.1%	-1.1%	-1.1%	-1.1%	-1.1%	-1.1%
Private Equity	-32.3%	-23.4%	-12.2%	4.5%	4.5%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
Infrastructure - Europe	-14.0%	-9.5%	-5.5%	-0.3%	2.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Cash	1.5%	0.4%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.5%	0.4%	0.5%
CPI	-1.8%	-1.4%	0.1%	0.2%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Scenario information as of September 30, 20XX

Expected returns are using AHIC 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. See capital market assumptions disclosure pages beginning on page 33.

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## Appendix

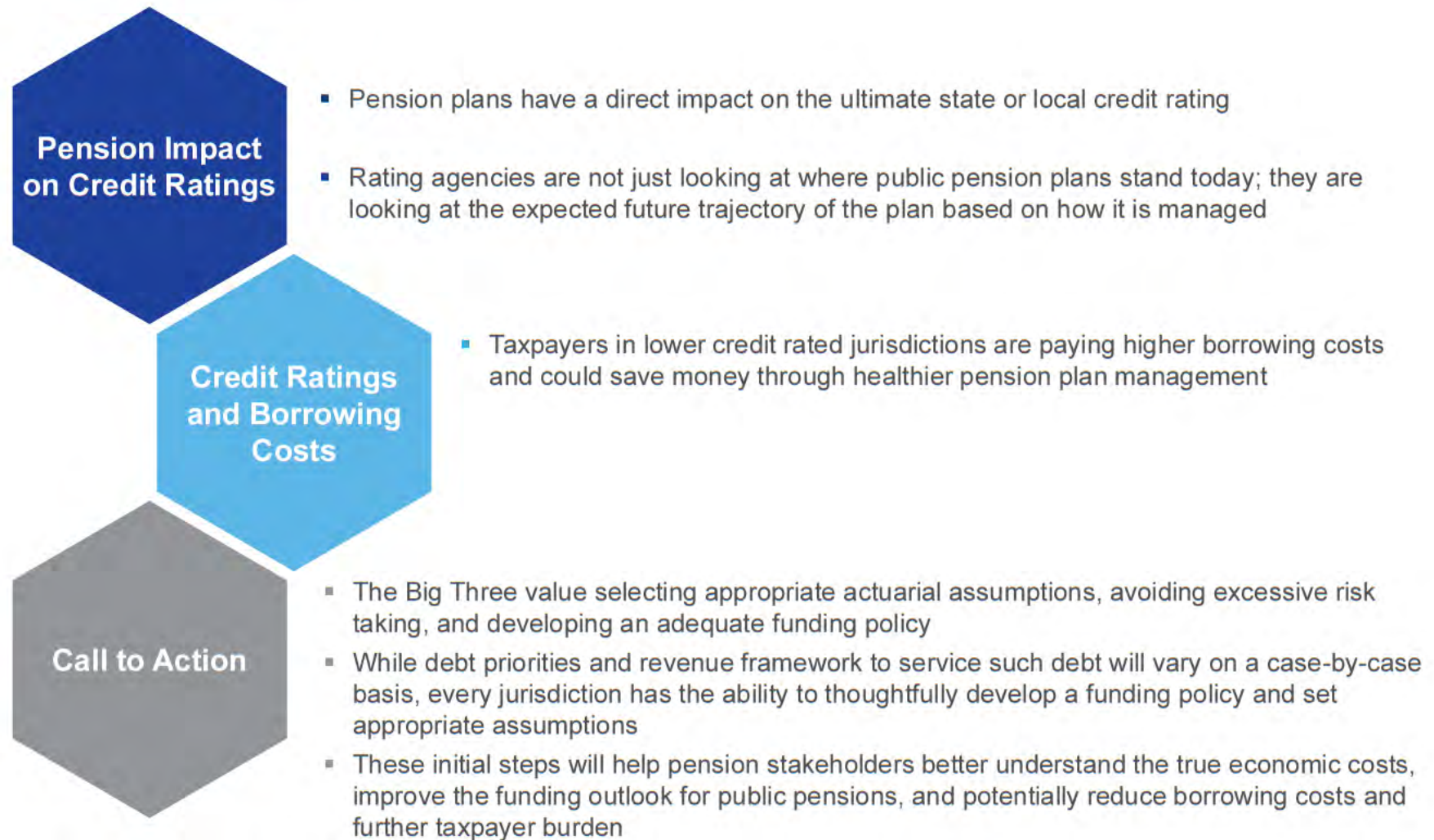
- How Do Public Pensions Impact Credit Ratings?



# How Do Public Pensions Impact Credit Ratings?

## Summary and Conclusions

SAMPLE REPORT








# How Do Public Pensions Impact Credit Ratings?

## Call to Action: Plan Sponsors Have Ability to Impact Credit Rating

SAMPLE REPORT

Below are three specific actions plan sponsors can take today to directly improve the impact a pension plan will have on the credit rating of its locality:

Action	Considerations
 <p><b>1. Conduct an actuarial assumption audit</b></p> <ul style="list-style-type: none"> <li>Review reasonability of key assumptions: <ul style="list-style-type: none"> <li>Salary scale, Mortality, Retirement rates, Turnover rates</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Assumptions set to plan-specific expectations will lead to lower contribution volatility</li> <li>Aggressive assumptions may provide short-term relief but may have long-term consequences</li> </ul>
 <p><b>2. Consider adjustments to expected return assumption</b></p> <ul style="list-style-type: none"> <li>Adjustments should be in line with forward-looking expectations for asset returns</li> </ul>	<ul style="list-style-type: none"> <li>Contributing an actuarial amount? <ul style="list-style-type: none"> <li><b>Yes:</b> Failing to achieve target returns will necessitate increases in future contributions and make what was intended to be a smooth, budget-friendly progression of contribution increases far more volatile</li> <li><b>No:</b> The funding gap will widen and become highly volatile as contribution policy will not add enough dollars to replenish losses</li> </ul> </li> </ul>
 <p><b>3. Review the plan's funding policy</b></p> <ul style="list-style-type: none"> <li>Look far enough into the future to identify potential pain points</li> </ul>	<ul style="list-style-type: none"> <li>Conduct "tread water"/hurdle rate analysis to ensure short-term contributions are sufficient to keep pace with growth of plan liabilities</li> <li>Consider asset-liability study to understand range of potential future outcomes rather than a single deterministic scenario</li> </ul>



## Appendix

- Investment Guidance for Public Employee Retirement System Trustees



# Investment Guidance for Public Employee Retirement System Trustees<sup>1</sup>

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1. **PERS trustees should look to the state for statutory direction on behalf of the taxpayers**
  - a) Prudent-person rule
  - b) Peer analysis
  
2. **PERS trustees should not be daunted by a liability value that exceeds the value of assets**
  - a) Do not feel obliged to incur greater risk in an effort to narrow the gap
  - b) Funded status has less to do with investment performance than it does with public policy and politics
  
3. **PERS trustees should not assume that an equity-oriented investment policy is suitable for their fund**
  - a) Discern the risk tolerance of taxpayers
  - b) May conclude that a moderate level of risk is warranted
  
4. **Trustees of individual PERSs should be cognizant of the existence and implications of the unitary state pension fund**
  - a) Unitary state pension fund is the only fund of economic consequence to the taxpayers
  - b) Multiple actively managed funds may form, in total, a closet index fund
  
5. **PERS investments should be exposed to rewarded risks, and insulated from unrewarded risks**
  - a) Market risk (equity exposure) is rewarded risk, on average
  - b) Diversifiable risk is not

<sup>1</sup> Richard M. Ennis, *Is a Statewide Pension Fund a Person or a Cookie Jar? The Answer Has Implications for Investment Policy*, Financial Analysts Journal, November-December 1988





## Appendix

- Asset-Liability Management Background

# Asset-Liability Management Background

## What is an Asset-Liability Study?

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SAMPLE REPORT

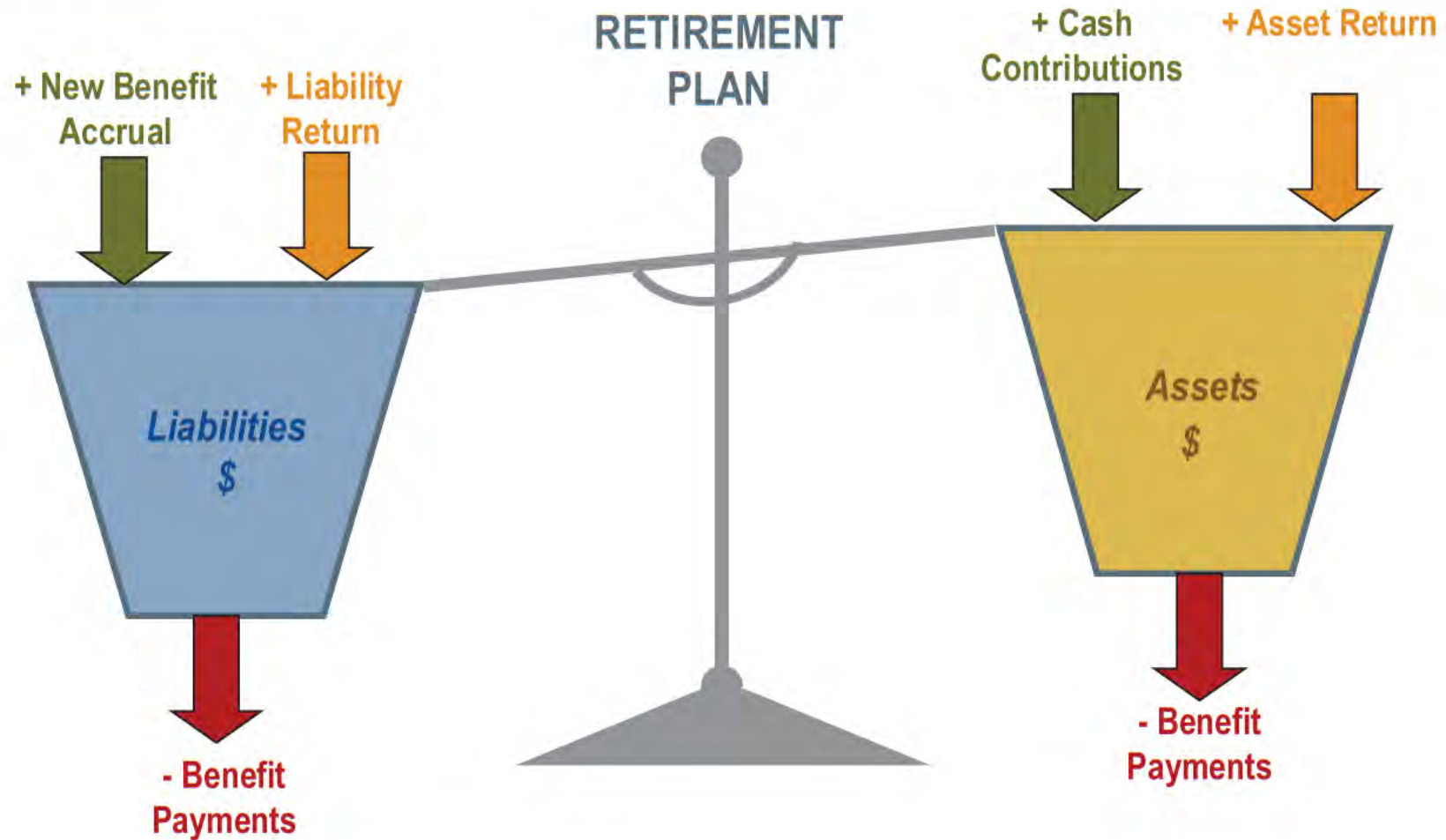
- Provides fiduciaries with an understanding of the dynamic relationship between plan assets and liabilities over time
- Illustrates the impact of various asset allocation targets on required contributions and funded status under a range of different macro-economic scenarios
- Identifies future trends in the financial health of the plan based on economic uncertainties that may not be evident from an actuarial valuation, which provides only a snapshot at a point in time
- Helps determine the level of risk that is appropriate in the context of the Plan's liabilities

An asset-liability study provides the tools to align  
a plan's risk taking with its liabilities

# Asset-Liability Management Background

## Balance of Liabilities and Assets

SAMPLE REPORT



Case ID: 210601197



# Asset-Liability Management Background

## Key Risks for Public Pension Plans

SAMPLE REPORT

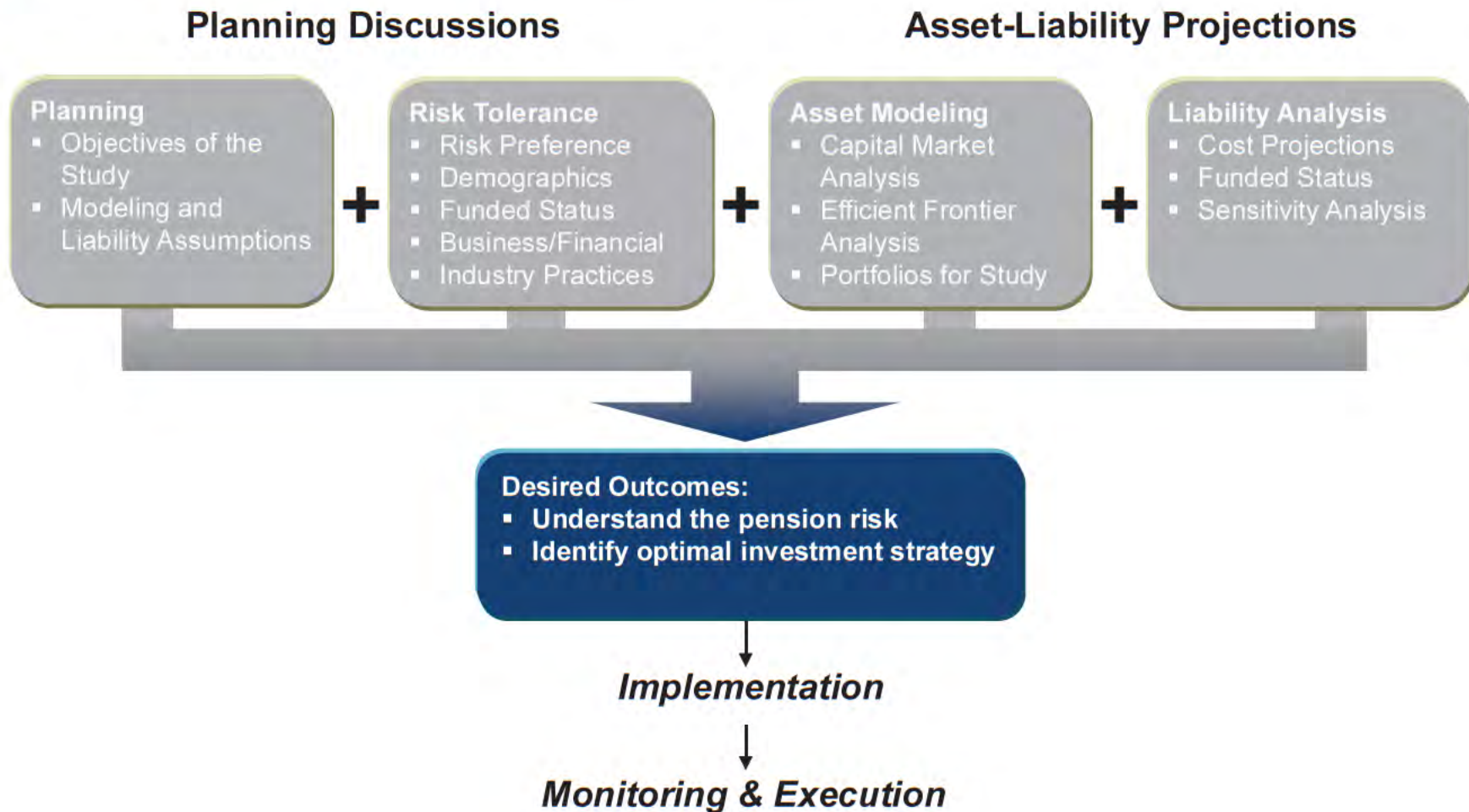
Types of Risk	Time Horizon	Risk Management Tools and Controls
<b>Return Shortfall</b> <ul style="list-style-type: none"> <li>Assets do not grow with liabilities</li> <li>Investment return &amp; contribution less than liability growth</li> </ul>	<b>Long-Term</b> (10+ years)	<ul style="list-style-type: none"> <li>Funding policy</li> <li>Plan design</li> <li>Investment policy</li> <li>Assumptions &amp; methods</li> </ul>
<b>Liquidity</b> <ul style="list-style-type: none"> <li>Cannot liquidate assets efficiently to meet needs</li> <li>Lose control of asset allocation</li> </ul>	<b>Short- to Medium-Term</b> (<5 years)	<ul style="list-style-type: none"> <li>Funding policy</li> <li>Benefit accruals</li> <li>Use of Illiquid investments</li> <li>Scenario analysis</li> <li>Monitoring</li> </ul>
<b>Investment</b> <ul style="list-style-type: none"> <li>Asset allocation (policy)</li> <li>Investment structure</li> <li>Manager selection</li> <li>Rebalancing</li> <li>Scenario (or path risk)</li> <li>Factor</li> </ul>	<b>Short-to Medium-Term</b> (<5 years)	<ul style="list-style-type: none"> <li>Investment policy statement               <ul style="list-style-type: none"> <li>Static/dynamic</li> <li>Asset allocation</li> <li>Rebalancing</li> <li>Manager guidelines</li> <li>Monitoring/roles &amp; responsibilities</li> </ul> </li> <li>Risk budgeting</li> <li>Monitoring / dashboards</li> <li>Medium term views</li> <li>Regression and scenario analysis</li> </ul>

Case ID: 210601197

# Asset-Liability Management Background

## Overview of the Asset-Liability Study Process

SAMPLE REPORT



Case ID: 210601197



# Asset-Liability Management Background Modeling Process

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SAMPLE REPORT

- Goals of an asset-liability study:
  - Understand the pension plan's asset-liability risk, and
  - Identify the optimal investment strategies
- Stochastic, Monte Carlo simulation analysis used
  - 5,000 independent economic trials
  - Building block approach
    - Starts with inflation and interest rates
    - Using a multi-factor regression analysis, other asset classes are then modeled
  - Assets and liabilities are modeled over the projection period
    - Projections include contribution requirements and funded ratios
- Asset-liability studies are best-suited to determine the optimal mix of return-seeking (e.g., equity) and fixed income assets for the pension fund
  - Asset mix is the single most important investment decision for the plan sponsor
    - Is it worthwhile to have a more aggressive allocation in order to reduce long term cost in exchange for risk of higher costs in a bad outcome?
    - Is it worthwhile to have a more conservative allocation in order to have a more predictable cost in exchange for potentially higher average costs?

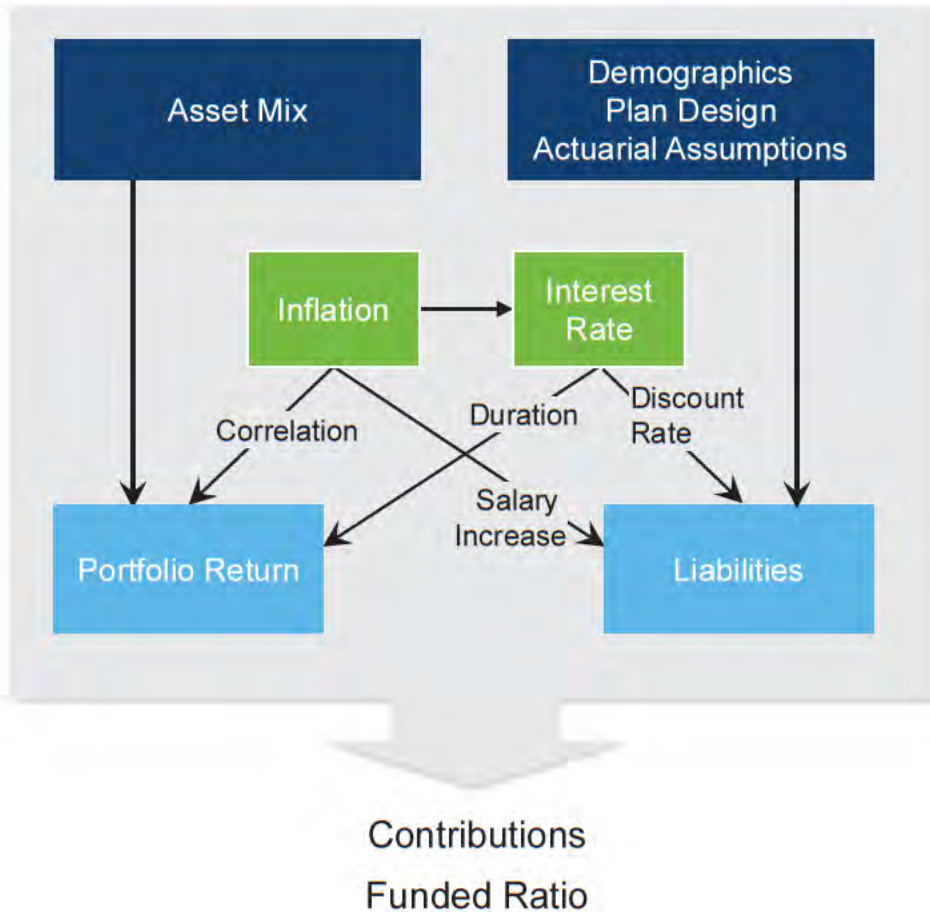
Case ID: 210601197



## Asset-Liability Management Background

### Mechanics of Asset-Liability Modeling Process

SAMPLE REPORT



Asset and liability modeling integrated in single platform

- Integrates impact of key economic variables

Flexibility in modeling parameters and output to client preferences

Stochastic and deterministic modeling performed

# Asset-Liability Management Background

## Long-Term Economic Cost of Plan

SAMPLE REPORT

**Long-Term Economic Cost =**

- **Present Value of Plan Contributions +**
- **Present Value of Terminal Funding, adjusted by a utility factor**

Terminal Funding	Surplus	Shortfall
Utility Rationale	Declining value, or utility, from very high funded ratios	Increasing "pain" as unfunded amounts grow to high levels
Threshold	PVB / AL	(5 Yrs. of Benefit Payments) / AL
Utility Factor above/below threshold	50%	200%

**Present Value of Plan Contributions**

- Main component of long-term economic cost
- Does not reflect the plan's funded status at the end of the forecast period

**Present Value of Terminal Funding**

- Reflects the plan's funded status at the end of the forecast period
- Surplus assets are valuable as they lower future contributions
- Unfunded liabilities are costs that will be recognized in future years

**Utility Factor Applied to Terminal Funding**

# Asset-Liability Management Background

## Utility Factor For Terminal Funded Status

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SAMPLE REPORT

- Modest deviations from 100% funding are normal, and no special adjustment is needed for these scenarios – the amount of surplus or unfunded liability can be reflected at its dollar value
- As surplus amounts grow to very high levels, there is a declining value, or utility, to the surplus:
  - Contributions cannot go below zero
  - Long contribution holidays may create a false sense of how much the plan really costs, and lead to confusion when cost levels revert to “normal”
  - Large surplus amounts can become a potential target for non-pension applications
- As unfunded amounts grow to very high levels, there is an increasing amount of “pain” as contributions rise to unacceptable levels:
  - May be viewed as “breaking trust” with future taxpayers
  - Freezing of the pension plan becomes a possibility



# Asset-Liability Management Background

## Risk and Return in an Asset-Liability Context

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SAMPLE REPORT

- **Traditional:**

- Return = Investment performance
- Risk = Annual volatility of investment gains and losses  
(e.g. weak/negative capital market returns)

- **Asset-Liability:**

- Return = Potential cost reduction or funded status improvement under average economic conditions
- Risk = During the worst economic conditions, contributions need to increase or funded status declines  
(e.g., stocks decline, inflation/deflation shocks and/or interest rates decline)

# Asset-Liability Management Background

## Key Factors Affecting the Risk/Reward Trade-off

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SAMPLE REPORT

- The key take-away from the A/L study is the allocation between equity (“return-seeking”) vs. fixed income (“risk-reducing”)
- Major factors affecting the ultimate mix are:
  - Time horizon (or amortization period of unfunded liability) to fund the liability: a longer time horizon supports more risk taking
  - Characteristics of plan participants: a growing population of active participants supports more risk taking; a mature population with significant retirees might need a more conservative policy
  - Funded status: a less funded plan can utilize additional returns from equity investments
  - Nature of plan benefits: a pension with sensitivity to wage inflation growth can benefit from equities in the long-term; an increased need in liquidity due to significant benefit payments in the near future can have a more conservative policy

Case ID: 210601197



# Appendix

- About This Material



## About This Material

---

This material includes a summary of calculations and consulting related to the finances of Client XYZ (XYZ). The following variables have been addressed:

- Contributions
- Economic Cost
- Funded Ratio
- Hurdle Rate
- 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 Hewitt Investment Consulting, Inc.

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

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 20XX actuarial valuation for XYZ 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 June 30, 20XX.

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.

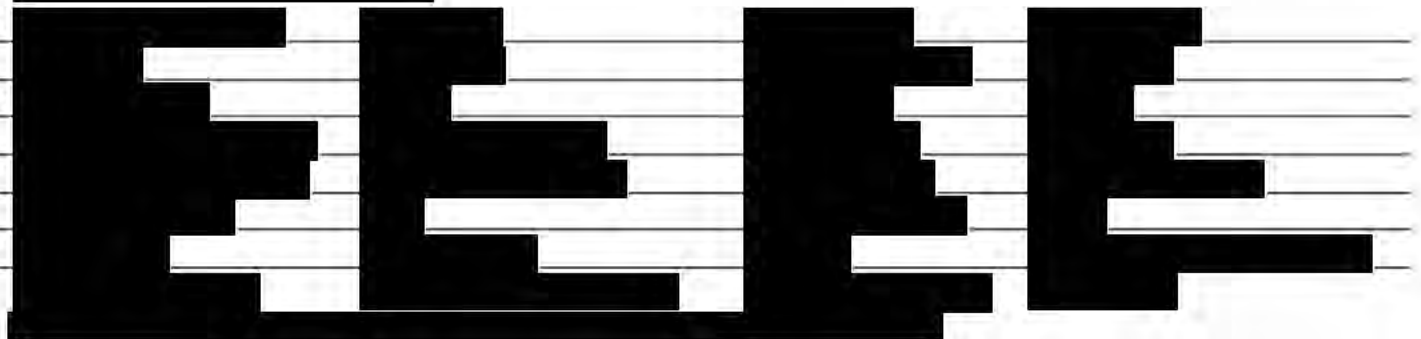
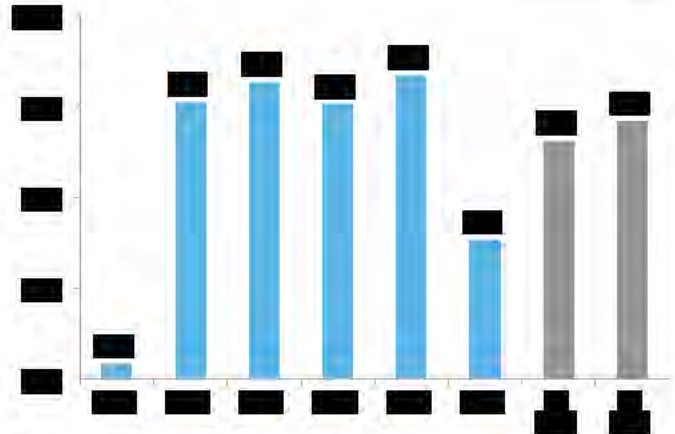
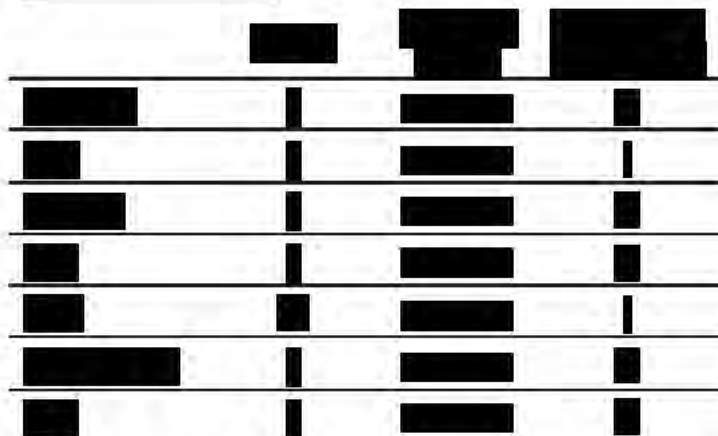
These projections have been conducted in accordance with generally accepted actuarial principles and practices, including applicable Actuarial Standards of Practice as issued by the Actuarial Standards Board. The undersigned actuary is familiar with the near-term and long-term aspects of pension valuations 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 associate of Aon Hewitt Investment Consulting, Inc. providing services to XYZ has any direct financial interest or indirect material interest in XYZ. Thus, we believe there is no relationship existing that might affect our capacity to prepare and certify this report for XYZ.

Aon Hewitt Investment Consulting, Inc.

Phil Kivarkis FSA, CFA

## J. Sample Operational Due Diligence Summary Assessment





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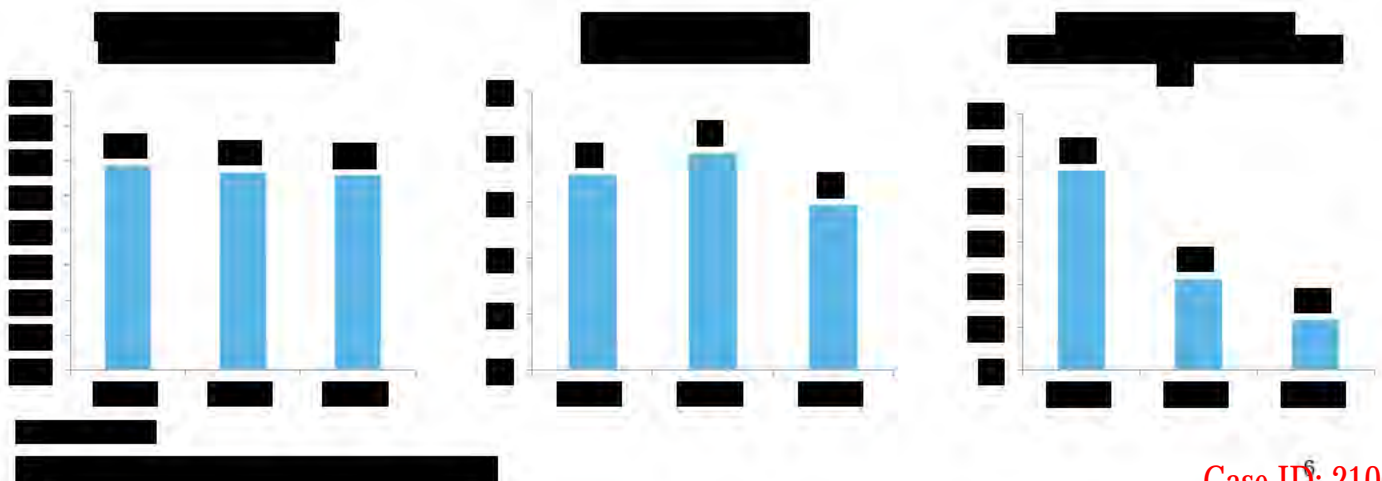
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**Risk Management**

**Factor Description**

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Government	Percentage
Current government	100%
Previous government	0%

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## K. Sample InBrief Report



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## L. Sample Quarterly Performance Report



PA Public School Employees' Retirement System | Third Quarter 2018

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## Quarterly Investment Review

Visit the Aon Retirement and Investment Blog (<http://retirementandinvestmentblog.aon.com>); sharing our best thinking.

Case ID: 210601197



Past performance is not necessarily indicative of future results. Please refer to the Notes section for disclosures related to the performance calculation methodology within this performance report. Additionally, please refer to the Appendix for referenced benchmark index definitions. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees or expenses.



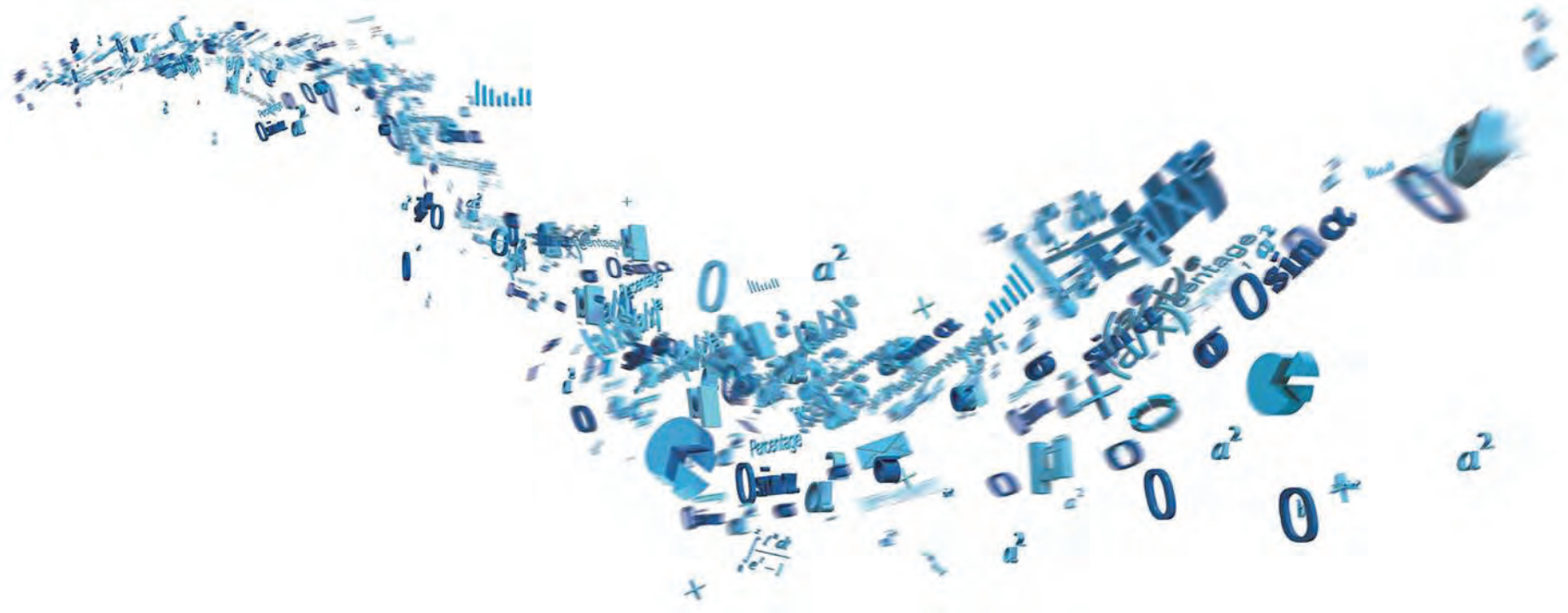
# Contents

1	Executive Summary	1
2	Total Fund	20
3	Total Public Markets	62
4	Total Equity	67
5	US Equity	72
6	Non-US Equity	87
7	Emerging Markets Equity	94
8	Non-US Equity ex Emerging Markets	101
9	Total Fixed Income	138
10	Investment Grade Fixed Income	139
11	US Core Plus Fixed Income	141
12	Non-US Developed Markets Fixed Income	156
13	US Treasuries	163
14	Credit-Related Fixed Income	168
15	Emerging Markets Fixed Income	170
16	High Yield	177
17	Inflation Protected	244
18	TIPS	246
19	PIMCO Multi-Sector	263
20	Real Assets	273
21	MLPs	278
22	Commodities	294
23	Risk Parity	327
24	Absolute Return	349
25	Market Environment	409
26	Notes and Disclaimers	423

Case ID: 210601197

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## Executive Summary

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## Your new Aon Client Portal is here!

On the portal, you'll be able to securely access:

- Documents shared by your consultant
- Thought leadership

Your consultant will be reaching out to you with details.



## Aon's 2019 Retirement & Investment Client Conference

Mark your calendar for September 25-26, 2019, as Aon will be hosting our Client Conference in Chicago. More details, such as the agenda and speakers, will be provided as the event gets closer.



## Be prepared for the workforce of the future!

In times of tightening labor markets, Aon's workforce consulting practices have hundreds of professionals who help employers address talent shortages, by:

- Customizing rewards based on what employees really want
- Combining best thinking, data, analytics, and technology to measure and address future skills and workforce gaps
- Developing intelligent tools that direct employees to new roles in which they can succeed



## Aon Hewitt Investment Consulting announces compliance with the Global Investment Performance Standards (GIPS®)

The proprietary pooled funds managed under full discretion by Aon Hewitt Investment Consulting (AHIC)—also known as “Aon-GIPS Firm”—claims compliance with the Global Investment Performance Standards (GIPS®)<sup>1</sup>, and has been independently verified by ACA Performance Services for the period of July 1, 2010 through December 31, 2017.

## Did you know?

### Aon Hewitt Investment Consulting has:

- **More than 360 U.S. investment consulting colleagues<sup>2</sup>**
- **More than 150 professionals dedicated to Investment Manager Research, including 98 dedicated to alternative strategies<sup>3</sup>**
- **477 U.S. Client relationships<sup>4</sup>**

Aon Hewitt Investment Consulting recently advised the largest defined contribution plan in the U.S, the \$554 billion Thrift Savings Plan for employees of the federal government, to redesign its custom target date funds.<sup>5</sup>

<sup>1</sup>GIPS® is a registered trademark of CFA Institute. CFA Institute has not been involved in the preparation or review of this material. For a copy of a presentation that complies with the GIPS standards and/or the firm's list of composite descriptions, please email [retirement@aonhewitt.com](mailto:retirement@aonhewitt.com)

<sup>2</sup>As of 6/30/2018

<sup>3</sup>As of 6/30/2018; total combined research staff as of 6/30/2018 includes 48 manager research colleagues of AHIC and Aon affiliates, 22 operational due diligence colleagues, and 83 Townsend colleagues from advisory, portfolio management and strategy teams. Offshore, Innovation, and Support staff represent additional colleagues. Some team members have cross team responsibilities or reporting lines outside the manager research function, includes AHIC and its global Aon affiliates.

<sup>4</sup>As of 3/31/2018, contains both discretionary and non-discretionary U.S. retainer clients

<sup>5</sup>Assets as of 12/31/2017. Project description at <https://www.govexec.com/pay-benefits/2018/09/tsp-increase-stock-holdings-across-lifecycle-funds/151368/>

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## Thought Leadership Highlights

### White Papers

All Investors: Debating Active vs. Passive	<a href="#">Link</a>
All Investors: Global Perspectives on Responsible Investing	<a href="#">Link</a>
All Investors: Making Portfolios More Fee-Efficient	<a href="#">Link</a>
All Investors: Commercial Real Estate Debt Overview	<a href="#">Link</a>
All Investors: Bank Capital Relief	<a href="#">Link</a>
All Investors: The Real Deal	<a href="#">Link</a>
All Investors: Why We Are in a Transition Environment	<a href="#">Link</a>
Public: How Do Public Pension Plans Impact Credit Ratings	<a href="#">Link</a>
Non-Profit: Key Components of Effective Investment Policy Statements for Non-Profit Organizations	<a href="#">Link</a>
Non-Profit: Key Topics for Non-Profit Organizations in 2018	<a href="#">Link</a>
All investors ex-DC: Direct Lending: An Investment Opportunity Within Private Debt	<a href="#">Link</a>
All Investors ex-DC: Alternative Premia, Alternative Price	<a href="#">Link</a>
Private DB: Rethink: Global Pension Risk Governance	<a href="#">Link</a>
Private DB: Aon's 2018 U.S. Annuity Settlement Market Update	<a href="#">Link</a>
Private DB: An Overview of the Multiemployer Pension Plan System	<a href="#">Link</a>
Private DB: The Third Dimension – Credit Path: Redefining Dynamic Management of Pension Risk	<a href="#">Link</a>
Private DB: U.S. Plan-Specific Mortality Studies: A Call to Action	<a href="#">Link</a>
DC: How Pension Benefits Affect the Optimal Target Date Fund	<a href="#">Link</a>
Health Care: Managing Health Care Reserves: Aligning Operating Assets with Broader Organizational Goals	<a href="#">Link</a>
Banking: Banking on Pensions	<a href="#">Link</a>

### Current Topics of Interest

Third Quarter 2018 Market Review and Outlook	<a href="#">Link</a>
Newsletters: <a href="#">Pathways Newsletter for Retirement Plans</a>   <a href="#">CIO Newsletter</a>   <a href="#">Connections Newsletter for Non-Profits</a>   <a href="#">Legal Consulting and Compliance Newsletter</a>	

### Aon Retirement and Investment Blog

<https://retirementandinvestmentblog.aon.com/>

Opinions, estimates, forecasts, and statements on financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. The views and strategies described may not be suitable for all investors. References to specific securities, asset classes, and financial markets are for illustrative purposes only and are not intended to be, and should not be interpreted as, recommendations.

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SED 20180601197



As of September 30, 2018

## Market Highlights

	Performance(%)										
	1 Quarter	Year To Date	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	Inception Date
Equity											
Dow Jones U.S. Total Stock Market Index	7.11	10.58	7.11	17.58	17.05	13.42	12.05	10.00	7.94	10.55	01/01/1987
S&P 500 Index	7.71	10.56	7.71	17.91	17.31	13.95	11.97	9.65	7.42	10.20	01/01/1926
MSCI USA IMI	7.08	10.65	7.08	17.65	17.14	13.52	12.11	10.06	7.93	10.14	06/01/1994
MSCI USA Large Cap Index	8.01	11.09	8.01	18.37	17.57	14.19	11.89	9.55	6.96	9.78	06/01/1994
MSCI USA Small Cap Index	4.22	10.83	4.22	16.20	17.15	11.94	13.01	10.99	N/A	10.31	01/01/2001
MSCI EAFE Index (Net)	1.35	-1.43	1.35	2.74	9.23	4.42	5.38	6.80	5.20	8.77	01/01/1970
MSCI EAFE Index (hedged)	2.32	0.53	2.32	4.25	7.74	5.66	4.36	4.61	3.08	7.11	01/01/1970
MSCI EAFE Index (Price)	0.76	-3.76	0.76	-0.01	6.27	1.65	2.42	3.95	2.65	6.31	01/01/1970
MSCI EAFE Small Cap Index (Net)	-0.88	-2.19	-0.88	3.73	12.39	7.96	9.68	9.55	N/A	8.81	01/01/2001
MSCI AC World ex USA IMI Index (Net)	0.39	-3.27	0.39	1.79	10.14	4.39	5.60	7.49	6.18	5.19	06/01/1994
MSCI AC World ex USA Index (Net)	0.71	-3.09	0.71	1.76	9.97	4.12	5.18	7.20	5.85	4.88	01/01/2001
MSCI Emerging Markets Index (Net)	-1.09	-7.68	-1.09	-0.81	12.36	3.61	5.40	9.65	9.85	10.27	02/01/1988
Fixed Income											
Bimbg. Barc. U.S. Aggregate	0.02	-1.60	0.02	-1.22	1.31	2.16	3.77	3.78	4.48	7.28	01/01/1976
Bimbg. Barc. U.S. Treasury: Long	-2.88	-5.79	-2.88	-3.56	0.72	4.41	5.45	5.56	5.80	8.03	01/01/1973
Barclays Global Agg GDP Weighted Dev x U.S. Index (unhedged)	-1.47	-3.16	-1.47	-1.63	2.40	-0.04	2.55	N/A	N/A	2.51	01/01/2005
Barclays Global Agg GDP Weighted Dev x U.S. Index (hedged)	-0.15	1.03	-0.15	2.24	3.04	3.81	4.42	N/A	N/A	4.22	01/01/2005
Bimbg. Barc. U.S. Corp: High Yield	2.40	2.57	2.40	3.05	8.15	5.54	9.46	7.74	6.92	8.87	07/01/1983
Bimbg. Barc. Emerging Market 10% Country Cap Index	-1.02	-6.73	-1.02	-5.32	4.94	-0.53	3.02	N/A	N/A	2.45	07/01/2008
Bimbg. Barc. Global Inflation-Linked: U.S. TIPS	-0.82	-0.84	-0.82	0.41	2.04	1.37	3.32	3.93	5.20	5.23	10/01/1997
Barclays World Inflation Linked Bonds (hedged)	-0.84	-0.44	-0.84	2.06	3.93	3.80	4.38	4.65	5.36	5.77	01/01/1997
Barclays Universal Index	0.27	-1.41	0.27	-1.00	1.98	2.53	4.22	4.11	4.80	6.02	01/01/1990
ICE Libor (3 month)	0.59	1.66	0.59	2.04	1.26	0.86	0.70	1.66	2.23	5.59	01/01/1977
ICE BofAML 3 Month U.S. T-Bill	0.49	1.30	0.49	1.59	0.84	0.52	0.34	1.30	1.93	4.92	01/01/1978
ICE BofAML US Treasury Bills 0-3M	0.49	1.27	0.49	1.54	0.78	0.48	0.30	1.23	1.84	2.50	07/01/1992

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As of September 30, 2018

## Market Highlights

	Performance(%)										
	1 Quarter	Year To Date	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	Inception Date
Infrastructure											
FTSE Dev. Core Infrastr 50/50 Index (Net) (Hedged)	0.09	0.96	0 09	2.84	8.81	9.40	N/A	N/A	N/A	9.92	01/01/2010
FTSE Developed Core Infrast 50/50 Index (Net)	-0.28	-1.24	-0.28	0.74	8.76	7.47	N/A	N/A	N/A	8.99	01/01/2010
MLP											
S&P MLP Index	6.39	7.46	6 39	7.15	4.90	-1.73	9.97	9.12	N/A	9.70	08/01/2001
Commodities											
Bloomberg Commodity Index Total Return	-2.02	-2.03	-2 02	2.59	-0.11	-7.18	-6.24	-1.07	1.55	2.26	02/01/1991
Bloomberg Gold Subindex Total Return	-5.00	-9.36	-5 00	-7.66	1.53	-2.68	2.41	7.00	6.65	4.20	02/01/1991
Real Estate											
Burgiss (Lagged) - Opportunistic	-0.56	6.32	-0 56	10.62	8.78	10.64	6.22	8.98	9.19	8.86	01/01/1993
Burgiss (Lagged) - Value Added	1.53	10.64	1 53	13.48	11.76	12.71	7.50	9.85	9.84	10.19	10/01/1997
NCREIF ODCE NOF 1 Quarter Lag	1.81	5.73	1.81	7.47	8.38	10.03	4.33	7.29	7.69	7.66	04/01/1978
FTSE EPRA/NAREIT Developed Index (Net)	-0.30	0.06	-0.30	3.66	6.19	5.43	6.04	N/A	N/A	5.75	03/01/2005
FTSE EPRA/NAREIT Custom Dev 100% Hedged USD (Net)	0.30	2.02	0 30	5.65	6.57	7.23	N/A	N/A	N/A	10.26	01/01/2012
Wilshire US Real Estate Securities Index	0.73	2.35	0.73	4.11	7.52	9.58	7.51	9.50	10.18	11.64	01/01/1978
Risk Parity											
Blended Policy (Risk Parity)	0.07	-1.89	0 07	2.73	7.89	5.55	8.19	8.66	9.07	4.05	10/01/2012
Private Markets											
Burgiss All Private Markets ex Real Estate (1Q Lag)	2.70	10.50	2.70	14.80	11.06	12.61	9.11	9.04	6.31	6.24	04/01/1998

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As of September 30, 2018

## Trailing Period Performance

	Performance(%)												Inception Date
	1 Quarter	2 Quarters	3 Quarters	YTD	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	
<b>PSERS Total Fund</b>	<b>1.40</b>	<b>3.52</b>	<b>3.66</b>	<b>3.66</b>	<b>1.40</b>	<b>7.37</b>	<b>8.78</b>	<b>7.31</b>	<b>6.41</b>	<b>7.46</b>	<b>6.92</b>	<b>9.71</b>	<b>07/01/1982</b>
Blended Policy (Total Plan)	1.21	2.87	2.81	2.81	1.21	6.33	8.23	6.90	6.31	6.81	6.11	N/A	
Value Added	0.19	0.65	0.85	0.85	0.19	1.04	0.55	0.41	0.10	0.65	0.81	N/A	
<b>Total Public Market Composite</b>	<b>0.78</b>	<b>2.76</b>	<b>1.62</b>	<b>1.62</b>	<b>0.78</b>	<b>5.36</b>	<b>8.04</b>	<b>5.67</b>	<b>6.29</b>	<b>6.57</b>	<b>N/A</b>	<b>6.54</b>	<b>06/01/2002</b>
Blended Policy (Public Market) (Hedged)	1.00	2.30	0.75	0.75	1.00	4.13	7.54	4.72	4.96	5.64	5.24	5.27	
Value Added	-0.22	0.46	0.87	0.87	-0.22	1.23	0.50	0.95	1.33	0.93	N/A	1.27	
Blended Policy (Public Market) (Unhedged)	0.94	1.23	0.17	0.17	0.94	3.63	7.34	4.32	4.76	5.50	5.14	5.15	
Value Added	-0.16	1.53	1.45	1.45	-0.16	1.73	0.70	1.35	1.53	1.07	N/A	1.39	
<b>Total Private Market Composite</b>	<b>3.42</b>	<b>5.98</b>	<b>10.49</b>	<b>10.49</b>	<b>3.42</b>	<b>14.12</b>	<b>11.30</b>	<b>11.46</b>	<b>6.10</b>	<b>11.24</b>	<b>9.59</b>	<b>10.18</b>	<b>12/01/1992</b>
Blended Policy (Private Market)	1.81	4.62	9.34	9.34	1.81	13.29	10.43	12.07	8.68	9.43	7.97	N/A	
Value Added	1.61	1.36	1.15	1.15	1.61	0.83	0.87	-0.61	-2.58	1.81	1.62	N/A	

PSERS Total Fund and Public Markets Composites incorporate the levered returns for the PSERS Gold and PSERS U.S. Long Treasuries accounts.

\*Total Fund Blended Policy Benchmark incorporates the performance of the Public Market Blended Policy Benchmark (Hedged).

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As of September 30, 2018

## Trailing Period Performance

	Performance (%)
	Since July 2011
PSERS Total Fund	7.02
Blended Policy (Total Plan)	6.46

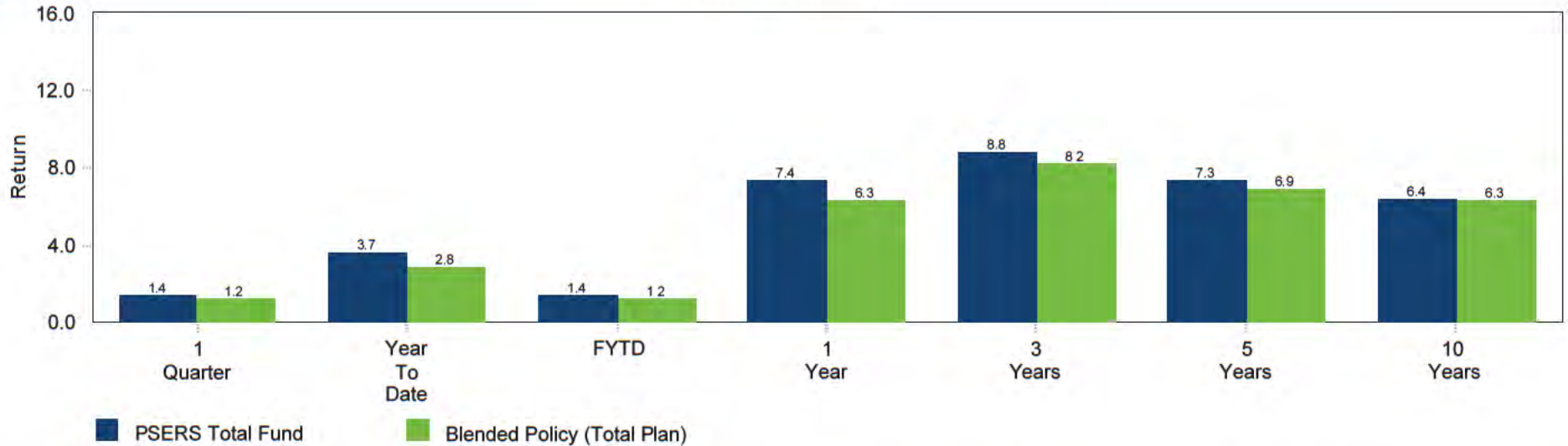
Case ID: 210601197

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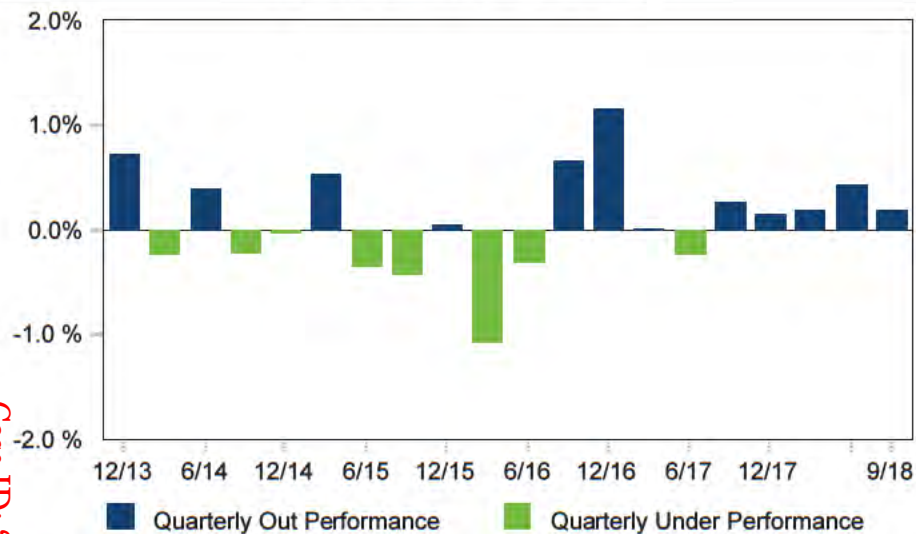


## Performance Summary

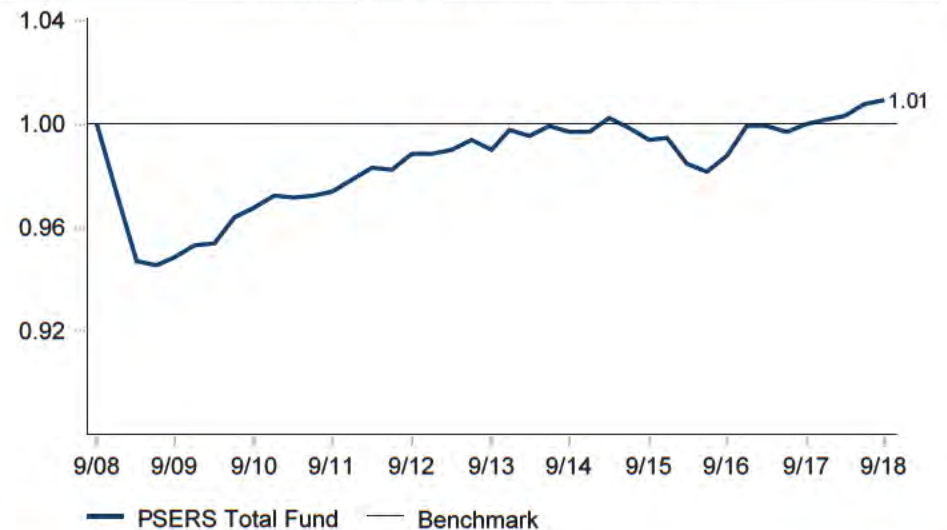
## Return Summary



## Quarterly Excess Performance



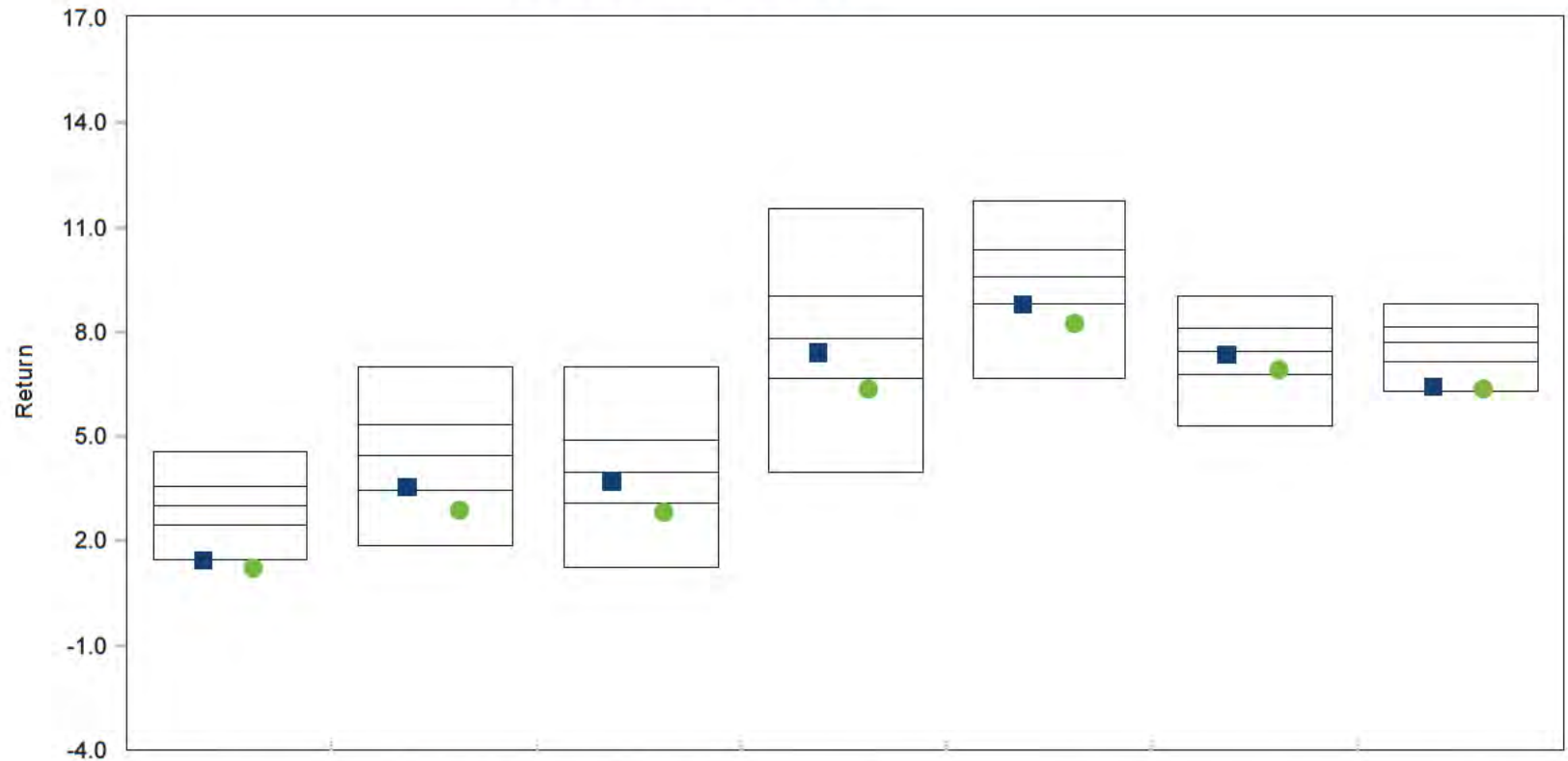
## Ratio of Cumulative Wealth - 10 Years



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## Peer Group Analysis

## All Public Plans-Total Fund



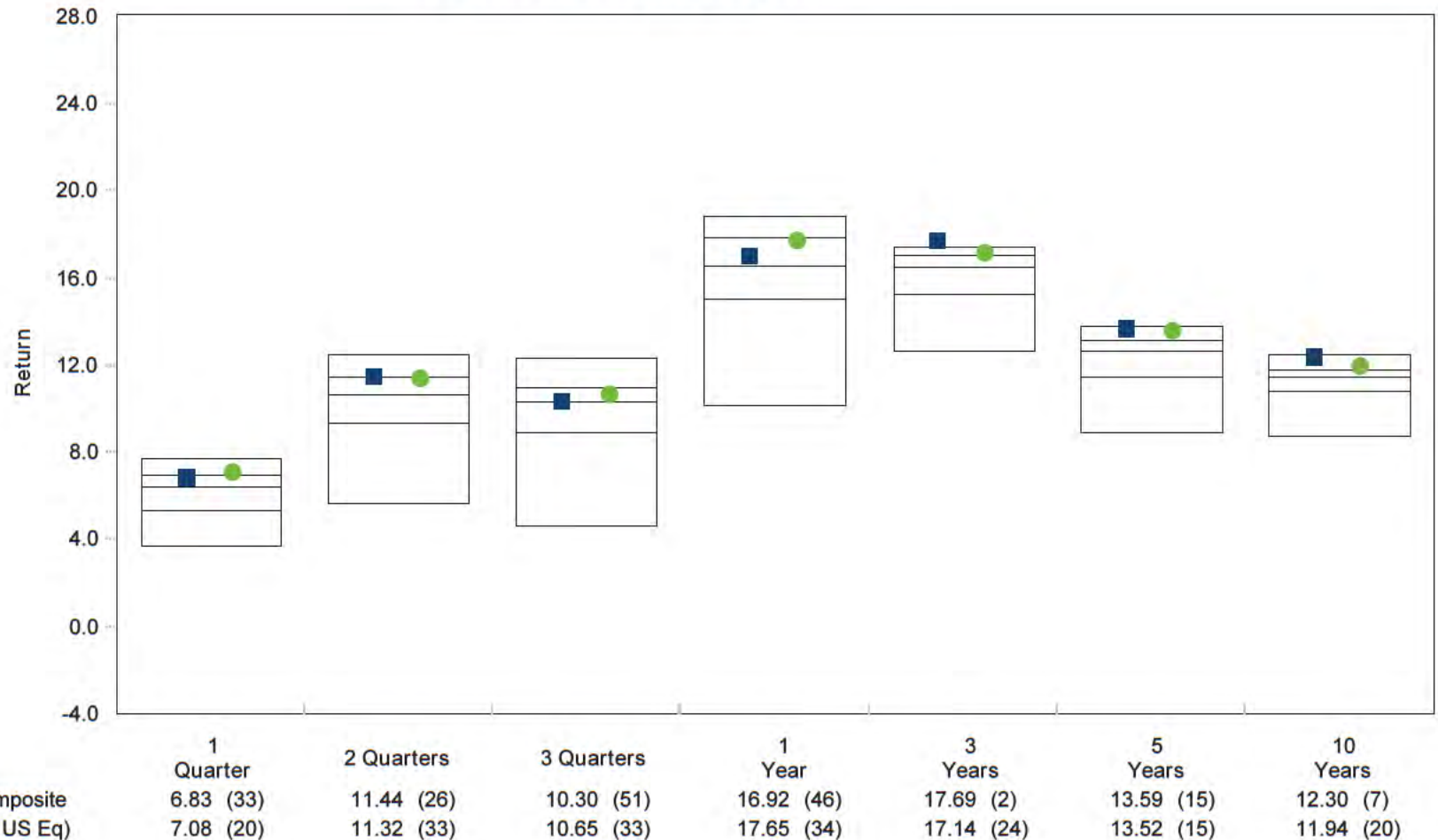
	1 Quarter	2 Quarters Ending Sep-2018	3 Quarters Ending Sep-2018	1 Year	3 Years	5 Years	10 Years
■ PSERS Total Fund	1.40 (96)	3.52 (73)	3.66 (63)	7.37 (63)	8.78 (77)	7.31 (56)	6.41 (94)
● Blended Policy (Total Plan)	1.21 (97)	2.87 (88)	2.81 (81)	6.33 (81)	8.23 (88)	6.90 (71)	6.31 (95)
5th Percentile	4.59	6.99	6.99	11.52	11.75	9.02	8.85
1st Quartile	3.56	5.32	4.89	9.06	10.35	8.09	8.18
Median	3.04	4.45	3.98	7.84	9.58	7.43	7.71
3rd Quartile	2.44	3.45	3.06	6.67	8.83	6.75	7.18
95th Percentile	1.46	1.83	1.24	3.98	6.64	5.27	6.27
Population	535	532	532	531	487	450	395

Parentheses contain percentile rankings.

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## Plan Sponsor Peer Group Analysis

## All Public Plans-US Equity Segment



5th Percentile  
1st Quartile  
Median  
3rd Quartile  
95th Percentile

Population

7.66	12.46	12.33	18.81	17.48	13.79	12.48
6.94	11.44	10.92	17.81	17.01	13.15	11.79
6.36	10.62	10.33	16.55	16.43	12.64	11.46
5.36	9.34	8.88	15.01	15.21	11.45	10.79
3.74	5.67	4.64	10.12	12.69	8.93	8.74
73	73	71	68	65	60	34

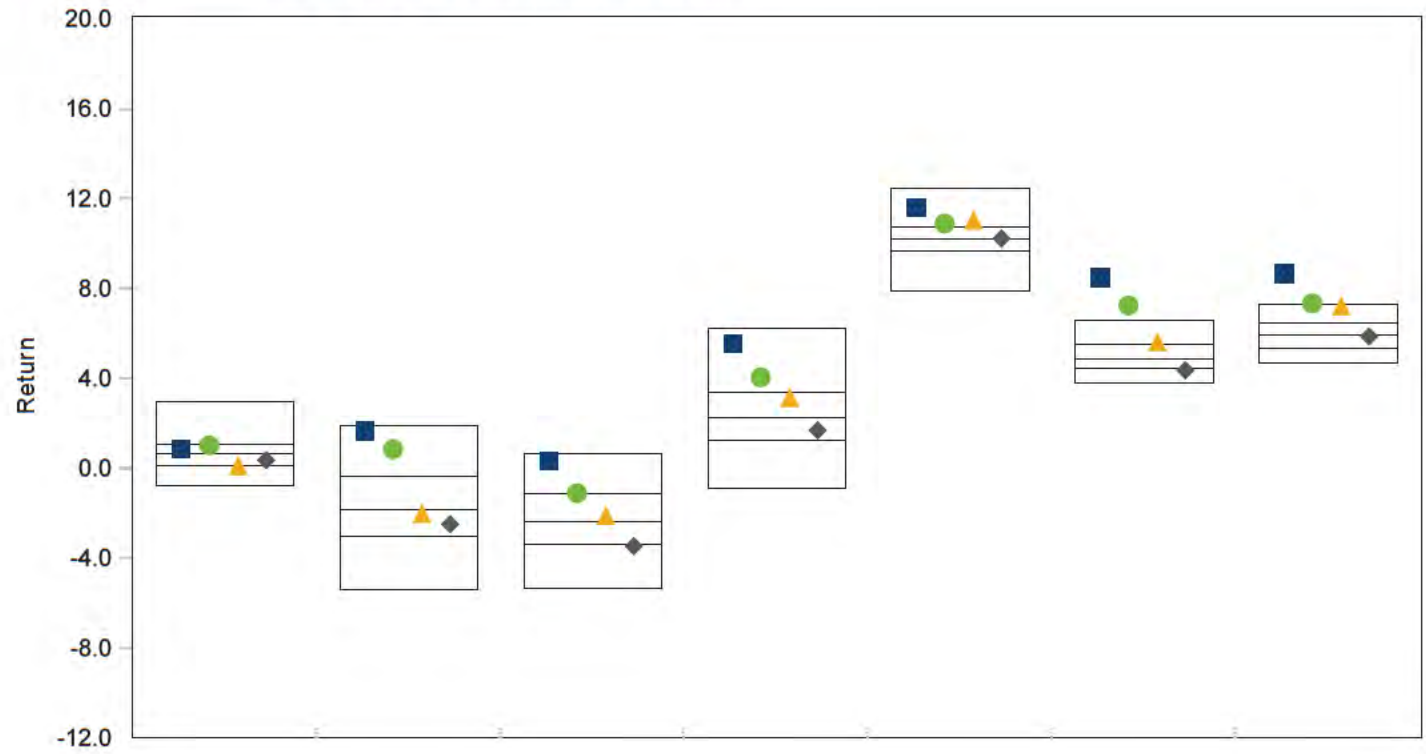
Parentheses contain percentile rankings.

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## Plan Sponsor Peer Group Analysis

## All Public Plans-Intl. Equity Segment



	1 Quarter	2 Quarters	3 Quarters	1 Year	3 Years	5 Years	10 Years
■ Total Non-U.S. Equity Composite (hedged)	0.79 (40)	1.61 (6)	0.27 (12)	5.52 (9)	11.54 (14)	8.41 (1)	8.59 (1)
● Blended Policy (Total Non-US Eq) (Hedged)	1.02 (28)	0.80 (11)	-1.15 (25)	4.04 (16)	10.86 (24)	7.20 (2)	7.27 (6)
▲ Total Non-U.S. Equity Composite (unhedged)	0.09 (76)	-2.01 (54)	-2.13 (45)	3.10 (31)	11.00 (18)	5.61 (21)	7.17 (7)
◆ Blended Policy (Total Non-US Eq) (Unhedged)	0.33 (66)	-2.51 (70)	-3.45 (77)	1.69 (67)	10.24 (50)	4.34 (81)	5.82 (56)
5th Percentile	2.90	1.88	0.63	6.20	12.45	6.61	7.28
1st Quartile	1.11	-0.34	-1.20	3.35	10.77	5.48	6.46
Median	0.58	-1.86	-2.39	2.24	10.23	4.87	5.92
3rd Quartile	0.09	-3.04	-3.40	1.24	9.71	4.45	5.30
95th Percentile	-0.76	-5.47	-5.30	-0.86	7.95	3.83	4.70
Population	75	74	74	73	69	60	34

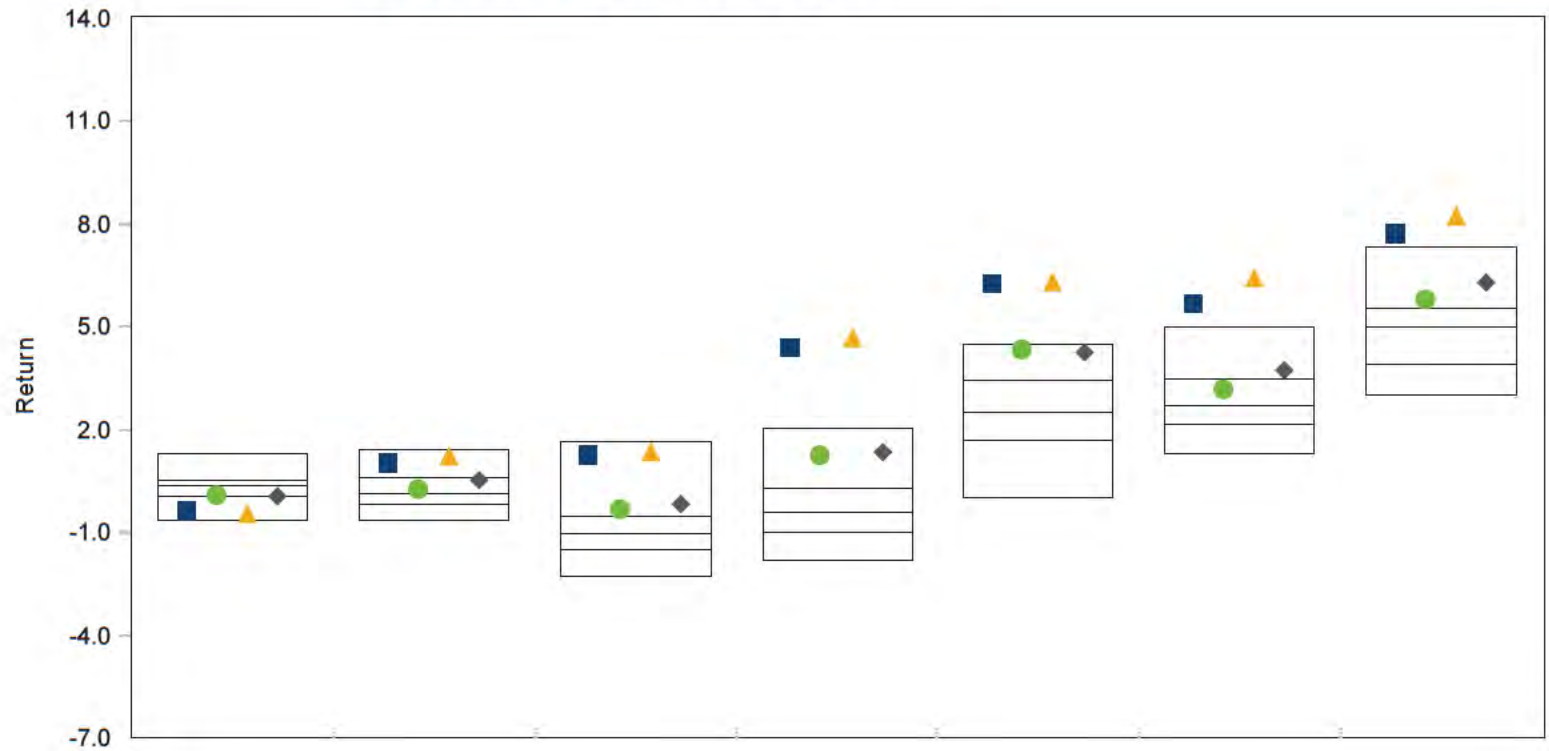
Parantheses contain percentile rankings.

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## Plan Sponsor Peer Group Analysis

## All Public Plans-US Fixed Income Segment



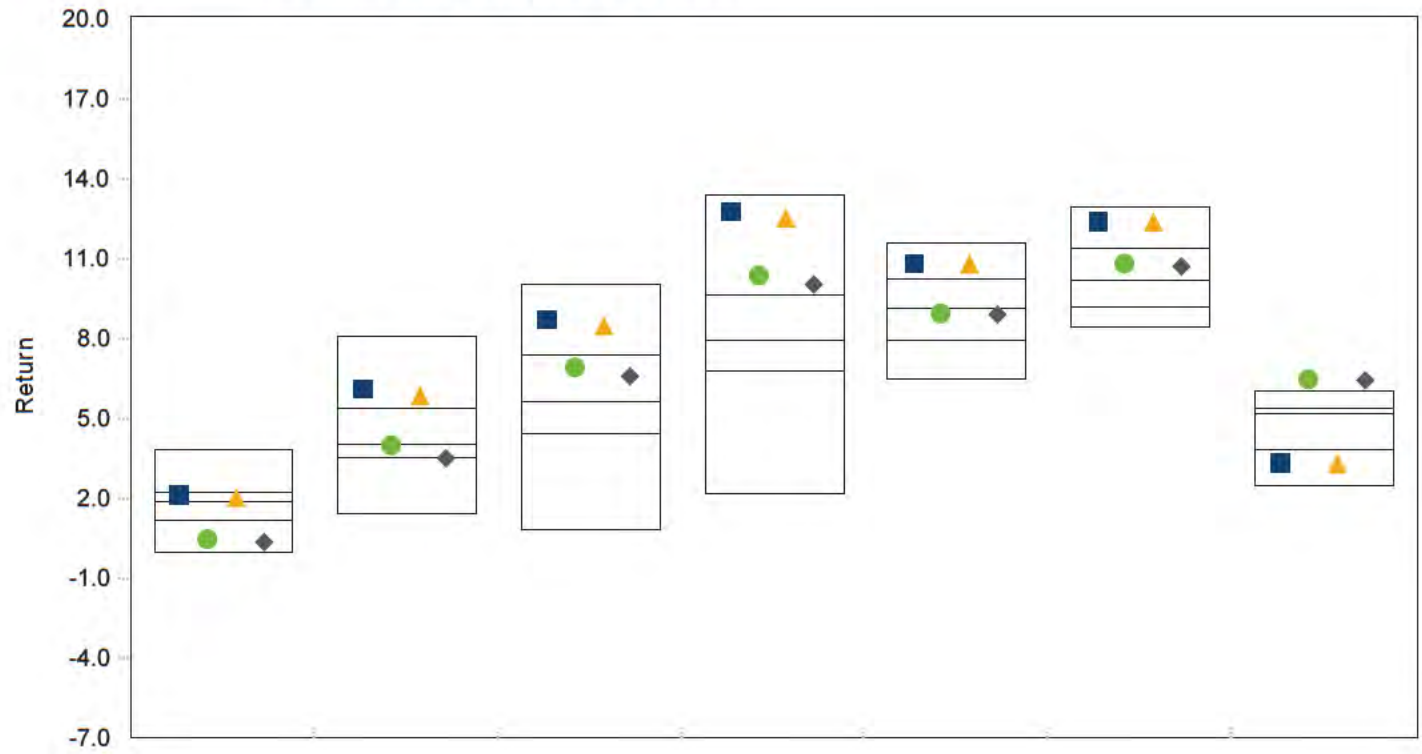
	1 Quarter	2 Quarters	3 Quarters	1 Year	3 Years	5 Years	10 Years
■ Total Fixed Income Composite	-0.42 (93)	1.01 (10)	1.21 (7)	4.35 (3)	6.25 (1)	5.64 (3)	7.68 (5)
● Blended Policy (Total FI)	0.05 (77)	0.24 (42)	-0.34 (23)	1.20 (11)	4.33 (10)	3.17 (41)	5.76 (19)
▲ Total US Fixed Income Composite	-0.47 (93)	1.22 (7)	1.36 (7)	4.66 (2)	6.30 (1)	6.39 (1)	8.20 (3)
◆ Blended Policy (Total US FI)	0.08 (76)	0.55 (26)	-0.19 (22)	1.36 (10)	4.28 (11)	3.72 (20)	6.30 (11)
5th Percentile	1.27	1.40	1.63	2.07	4.49	5.03	7.38
1st Quartile	0.54	0.56	-0.53	0.30	3.45	3.50	5.54
Median	0.35	0.14	-1.06	-0.43	2.51	2.69	5.02
3rd Quartile	0.08	-0.20	-1.53	-1.02	1.68	2.17	3.90
95th Percentile	-0.66	-0.64	-2.25	-1.83	0.02	1.28	3.04
Population	77	77	77	76	72	67	38

Parantheses contain percentile rankings.

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## Plan Sponsor Peer Group Analysis

## All Public Plans-Real Estate Segment

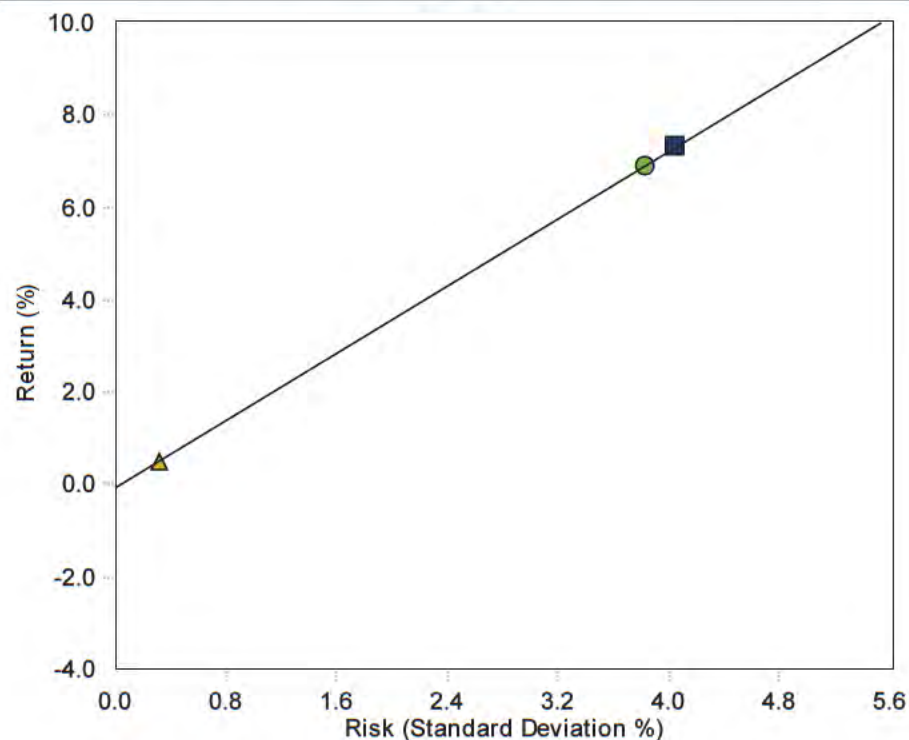


	1 Quarter	2 Quarters	3 Quarters	1 Year	3 Years	5 Years	10 Years
■ Total Real Estate (levered/hedged)	2.09 (33)	6.02 (18)	8.65 (12)	12.70 (7)	10.80 (14)	12.38 (8)	3.26 (90)
● Blended Policy (Total Real Estate) (Hedged)	0.43 (90)	3.91 (54)	6.87 (29)	10.36 (17)	8.94 (52)	10.76 (40)	6.44 (1)
▲ Total Real Estate (levered/unhedged)	2.03 (38)	5.79 (21)	8.48 (13)	12.51 (8)	10.78 (15)	12.36 (8)	3.26 (90)
◆ Blended Policy (Total Real Estate) (Unhedged)	0.32 (91)	3.51 (76)	6.54 (32)	10.03 (18)	8.89 (52)	10.74 (41)	6.42 (1)
5th Percentile	3.81	8.07	9.99	13.42	11.60	12.92	6.04
1st Quartile	2.19	5.37	7.40	9.63	10.24	11.34	5.36
Median	1.84	4.06	5.57	7.91	9.09	10.19	5.13
3rd Quartile	1.16	3.52	4.38	6.79	7.90	9.22	3.82
95th Percentile	0.00	1.44	0.77	2.17	6.52	8.45	2.43
Population	46	42	39	37	26	22	11

Parenthesees contain percentile rankings.

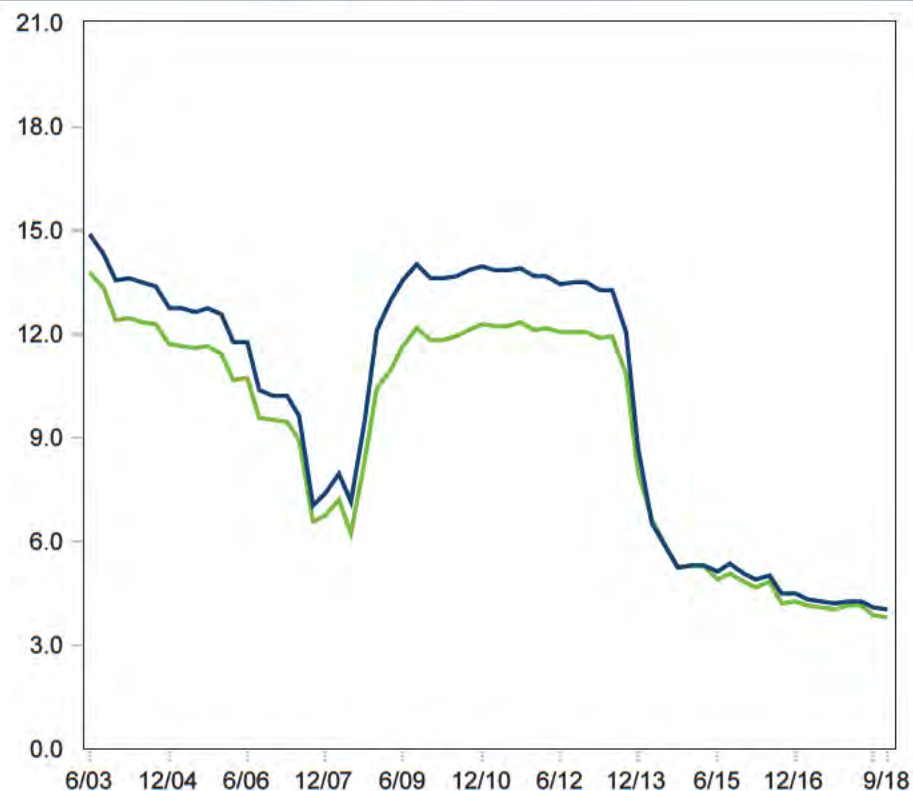
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## Risk Profile

Annualized Return vs. Annualized Standard Deviation  
5 Years

■ PSERS Total Fund      ● Blended Policy (Total Plan)  
▲ FTSE 3 Month T-Bill

Rolling 5 Years Standard Deviation



— PSERS Total Fund      — Blended Policy (Total Plan)

5 Years Historical Statistics

	Active Return	Tracking Error	Information Ratio	R-Squared	Sharpe Ratio	Alpha	Beta	Return	Standard Deviation	Actual Correlation
PSERS Total Fund	0.40	0.98	0.40	0.94	1.66	0.22	1.03	7.31	4.05	0.97
Blended Policy (Total Plan)	0.00	0.00	N/A	1.00	1.65	0.00	1.00	6.90	3.83	1.00
FTSE 3 Month T-Bill	-6.31	3.83	-1.65	0.00	N/A	0.46	0.00	0.49	0.32	0.05

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As of September 30, 2018

## Trailing Period Performance

	Performance(%)												
	1 Quarter	2 Quarters	3 Quarters	YTD	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	Inception Date
Total Public and Private Equity Exposure (hedged)	3.30	5.18	6.46	6.46	3.30	11.20	12.49	N/A	N/A	N/A	N/A	9.09	10/01/2014
Total Public Equity Composite (hedged)	2.66	4.39	3.36	3.36	2.66	8.95	13.46	10.23	10.01	9.11	7.90	7.06	07/01/1998
Blended Policy (Public Equity) (Hedged)	3.37	4.85	3.36	3.36	3.37	9.24	13.33	9.80	9.27	8.70	7.01	6.20	
Value Added	-0.71	-0.46	0.00	0.00	-0.71	-0.29	0.13	0.43	0.74	0.41	0.89	0.86	
Total US Equity Composite	6.83	11.44	10.30	10.30	6.83	16.92	17.69	13.59	12.30	9.80	N/A	6.96	01/01/2000
Blended Policy (Tot US Eq)	7.08	11.32	10.65	10.65	7.08	17.65	17.14	13.52	11.94	9.92	N/A	6.11	
Value Added	-0.25	0.12	-0.35	-0.35	-0.25	-0.73	0.55	0.07	0.36	-0.12	N/A	0.85	
Total Non-U.S. Equity Composite (hedged)	0.79	1.61	0.27	0.27	0.79	5.52	11.54	8.41	8.59	9.66	N/A	5.87	01/01/2000
Blended Policy (Total Non-US Eq) (Hedged)	1.02	0.80	-1.15	-1.15	1.02	4.04	10.86	7.20	7.27	8.63	N/A	4.87	
Value Added	-0.23	0.81	1.42	1.42	-0.23	1.48	0.68	1.21	1.32	1.03	N/A	1.00	
Emerging Markets Equity Composite	-6.01	-11.07	-10.72	-10.72	-6.01	-4.46	5.53	2.12	4.60	8.94	9.00	7.63	07/01/1998
Blended Policy (MSCI EM net)	-1.45	-9.35	-8.22	-8.22	-1.45	-1.18	12.22	3.54	5.36	9.73	9.96	8.49	
Value Added	-4.56	-1.72	-2.50	-2.50	-4.56	-3.28	-6.69	-1.42	-0.76	-0.79	-0.96	-0.86	
Total Alternative Investments (hedged)	4.20	6.26	11.36	11.36	4.20	14.90	11.51	10.64	7.86	12.84	10.51	10.40	07/01/1998
Burgiss All Private Markets ex Real Estate (1Q Lag)	2.70	5.46	10.50	10.50	2.70	14.80	11.06	12.61	9.11	9.04	6.31	6.24	04/01/1998
Total Fixed Income Composite (hedged)	-0.42	1.01	1.21	1.21	-0.42	4.35	6.25	5.64	7.68	6.45	6.41	6.59	07/01/1998
Blended Policy (Total FI)	0.05	0.24	-0.34	-0.34	0.05	1.20	4.33	3.17	5.76	5.07	5.38	5.57	
Value Added	-0.47	0.77	1.55	1.55	-0.47	3.15	1.92	2.47	1.92	1.38	1.03	1.02	
Investment Grade Composite	-2.02	-2.65	-5.39	-5.39	-2.02	-3.47	1.92	N/A	N/A	N/A	N/A	2.81	10/01/2014
Blended Policy (Investment Grade)	-0.97	-0.90	-2.70	-2.70	-0.97	-1.59	1.26	2.68	4.30	N/A	N/A	1.86	
Value Added	-1.05	-1.75	-2.69	-2.69	-1.05	-1.88	0.66	N/A	N/A	N/A	N/A	0.95	
US Core Plus Fixed Income Composite	0.00	-0.55	-1.77	-1.77	0.00	-0.69	2.80	3.49	5.56	N/A	N/A	4.79	10/01/2004
Blended Policy (Barclays Aggregate Index)	0.02	-0.14	-1.60	-1.60	0.02	-1.22	1.31	2.16	3.83	3.85	4.60	3.81	
Value Added	-0.02	-0.41	-0.17	-0.17	-0.02	0.53	1.49	1.33	1.73	N/A	N/A	0.98	
Non-U.S. Developed Markets Fixed Income	0.22	0.02	0.83	0.83	0.22	1.77	3.66	0.69	3.79	3.99	4.25	4.58	07/01/1998
Blended Policy (Barclays Global Agg GDP weighted)	-0.15	0.27	1.03	1.03	-0.15	2.24	3.04	0.07	2.82	N/A	N/A	N/A	
Value Added	0.37	-0.25	-0.20	-0.20	0.37	-0.47	0.62	0.62	0.97	N/A	N/A	N/A	
U.S. Treasuries Total (unlevered)	-3.49	-3.72	-7.51	-7.51	-3.49	-5.68	-0.77	2.54	N/A	N/A	N/A	0.44	07/01/2012
Bimbg. Barc. U.S. Treasury: Long	-2.88	-2.58	-5.79	-5.79	-2.88	-3.56	0.72	4.41	5.45	5.56	5.80	1.71	
Value Added	-0.61	-1.14	-1.72	-1.72	-0.61	-2.12	-1.49	-1.87	N/A	N/A	N/A	-1.27	
Credit-Related (hedged)	2.25	4.70	6.56	6.56	2.25	9.26	9.05	N/A	N/A	N/A	N/A	6.32	10/01/2014
Blended Policy (Credit-Related)	2.10	2.20	1.72	1.72	2.10	2.29	8.03	N/A	N/A	N/A	N/A	4.10	
Value Added	0.15	2.50	4.84	4.84	0.15	6.97	1.02	N/A	N/A	N/A	N/A	2.22	
Emerging Markets Fixed Income	0.97	-3.67	-1.20	-1.20	0.97	1.00	8.20	2.36	N/A	N/A	N/A	3.93	04/01/2010
Blended Policy (Barclays Emerging Mkt 10% Country Cap)	-1.02	-9.81	-6.73	-6.73	-1.02	-5.32	4.94	-0.53	3.56	6.58	N/A	1.78	
Value Added	1.99	6.14	5.53	5.53	1.99	6.32	3.26	2.89	N/A	N/A	N/A	2.15	
High Yield Fixed Income Composite (hedged)	2.34	5.33	7.14	7.14	2.34	9.87	9.00	7.95	9.43	8.26	N/A	8.06	10/01/1999
Blended Policy (Barclays Corporate HY)	2.40	3.46	2.57	2.57	2.40	3.05	8.15	5.54	9.32	7.80	7.30	7.48	
Value Added	-0.06	1.87	4.57	4.57	-0.06	6.82	0.85	2.41	0.11	0.46	N/A	0.58	
Inflation Protected (unlevered)	-0.74	0.11	0.31	0.31	-0.74	2.71	3.44	4.68	8.03	N/A	N/A	6.95	04/01/2004
Blended Policy (Barclays World Inflation Linked Bond - Hedged)	-0.84	-0.52	-0.44	-0.44	-0.84	2.06	3.93	2.50	3.89	4.32	5.50	3.99	
Value Added	0.10	0.63	0.75	0.75	0.10	0.65	-0.49	2.18	4.14	N/A	N/A	2.96	
TIPS Composite (unlevered)	-0.74	0.11	0.31	0.31	-0.74	2.71	3.44	4.68	8.03	N/A	N/A	6.95	04/01/2004
Blended Policy (Barclays World Inflation Linked Bond - Hedged)	-0.84	-0.52	-0.44	-0.44	-0.84	2.06	3.93	2.50	3.89	4.32	5.50	3.99	
Value Added	0.10	0.63	0.75	0.75	0.10	0.65	-0.49	2.18	4.14	N/A	N/A	2.96	
MCO Multi-Sector Strategy	-0.42	-0.26	-0.89	-0.89	-0.42	-0.11	3.61	2.62	N/A	N/A	N/A	2.75	07/01/2012
Blended Policy (PIMCO Multi-Sector)	-0.49	-0.32	-1.05	-1.05	-0.49	-0.01	3.08	2.62	4.39	4.19	4.79	2.67	
Value Added	0.07	0.06	0.16	0.16	0.07	-0.10	0.53	0.00	N/A	N/A	N/A	0.08	

The indicated index in parenthesis of Blended Policy represents current benchmark. Description of Blended Policy is provided in Appendix of this report

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As of September 30, 2018

## Trailing Period Performance

	Performance(%)												Inception Date
	1 Quarter	2 Quarters	3 Quarters	YTD	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	
Real Assets (unlevered/hedged)	0.78	4.61	3.39	3.39	0.78	6.28	6.95	N/A	N/A	N/A	N/A	3.35	10/01/2014
Blended Policy (Real Assets) (Hedged)	0.21	3.75	2.90	2.90	0.21	5.69	5.89	N/A	N/A	N/A	N/A	2.86	
Value Added	0.57	0.86	0.49	0.49	0.57	0.59	1.06	N/A	N/A	N/A	N/A	0.49	
Total Infrastructure Composite (unlevered/hedged)	3.60	15.38	5.89	5.89	3.60	6.37	N/A	N/A	N/A	N/A	N/A	8.52	11/01/2015
Blended Policy (Infrastructure Hedged)	4.27	15.55	5.54	5.54	4.27	6.11	9.42	9.77	N/A	N/A	N/A	8.16	
Value Added	-0.67	-0.17	0.35	0.35	-0.67	0.26	N/A	N/A	N/A	N/A	N/A	0.36	
Commodities Composite (unlevered)	-3.29	-5.23	-5.01	-5.01	-3.29	-1.50	2.86	-3.52	-2.83	N/A	N/A	-1.26	11/01/2006
Blended Policy (Commodities)	-3.14	-4.92	-4.82	-4.82	-3.14	-1.34	0.72	-5.43	-5.17	N/A	N/A	-3.77	
Value Added	-0.15	-0.31	-0.19	-0.19	-0.15	-0.16	2.14	1.91	2.34	N/A	N/A	2.51	
Total Real Estate (unlevered/hedged)	2.00	5.77	8.38	8.38	2.00	12.20	10.31	12.07	3.12	8.16	8.47	8.23	04/01/1981
Blended Policy (Total Real Estate) (Hedged)	0.43	3.91	6.87	6.87	0.43	10.36	8.94	10.76	6.44	9.13	9.29	8.57	
Value Added	1.57	1.86	1.51	1.51	1.57	1.84	1.37	1.31	-3.32	-0.97	-0.82	-0.34	
Private Real Estate Composite	2.29	5.45	9.11	9.11	2.29	12.99	10.99	12.59	2.18	8.69	8.65	9.46	07/01/1996
Blended Policy (Private Real Estate)	0.46	3.35	7.59	7.59	0.46	11.04	9.43	11.07	6.58	9.23	9.37	9.79	
Value Added	1.83	2.10	1.52	1.52	1.83	1.95	1.56	1.52	-4.40	-0.54	-0.72	-0.33	
PTRES Composite (unlevered/hedged)	-0.15	8.67	1.87	1.87	-0.15	5.31	6.45	6.47	6.61	8.55	9.53	8.80	07/01/1998
Blended Policy (PTRES) (Hedged)	0.30	7.56	2.03	2.03	0.30	5.66	6.57	5.53	6.20	7.82	8.93	8.14	
Value Added	-0.45	1.11	-0.16	-0.16	-0.45	-0.35	-0.12	0.94	0.41	0.73	0.60	0.66	
Risk Parity Composite (vol adjusted)	0.34	1.54	-0.94	-0.94	0.34	3.40	7.37	5.27	N/A	N/A	N/A	3.64	10/01/2012
Blended Policy (Risk Parity)	0.07	-0.19	-1.89	-1.89	0.07	2.73	7.89	5.55	8.19	8.66	9.07	4.05	
Value Added	0.27	1.73	0.95	0.95	0.27	0.67	-0.52	-0.28	N/A	N/A	N/A	-0.41	
Total Absolute Return	0.93	1.31	3.45	3.45	0.93	4.88	3.83	4.01	5.98	N/A	N/A	5.20	10/01/2005
Blended Policy (3-month Libor + 3.5%)	1.46	2.93	4.32	4.32	1.46	5.61	4.80	4.94	6.35	6.90	7.17	6.73	
Value Added	-0.53	-1.62	-0.87	-0.87	-0.53	-0.73	-0.97	-0.93	-0.37	N/A	N/A	-1.53	
Unallocated Cash & Cash Equivalents	0.56	1.07	1.44	1.44	0.56	2.06	0.96	0.72	1.00	0.64	0.41	0.50	07/01/1998
ICE BofAML 3 Month U.S. T-Bill	0.49	0.95	1.30	1.30	0.49	1.59	0.84	0.52	0.34	1.30	1.93	1.98	
Value Added	0.07	0.12	0.14	0.14	0.07	0.47	0.12	0.20	0.66	-0.66	-1.52	-1.48	

The indicated index in parenthesis of Blended Policy represents current benchmark. Description of Blended Policy is provided in Appendix of this report

Past performance is not necessarily indicative of future results. Please refer to the Notes section for disclosures related to the performance calculation methodology within this performance report. Additionally, please refer to the Appendix for referenced benchmark index definitions. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees or expenses.

As of September 30, 2018

## Trailing Period Performance

	Performance(%)												Inception Date
	1 Quarter	2 Quarters	3 Quarters	YTD	FYTD	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years	Since Inception	
<b>PSERS Total Fund</b>	1.40	3.52	3.66	3.66	1.40	7.37	8.78	7.31	6.41	7.46	6.92	9.71	07/01/1982
Blended Policy (Total Plan)	1.21	2.87	2.81	2.81	1.21	6.33	8.23	6.90	6.31	6.81	6.11	N/A	
Value Added	0.19	0.65	0.85	0.85	0.19	1.04	0.55	0.41	0.10	0.65	0.81	N/A	
<b>Total Public and Private Equity Exposure (hedged)</b>	3.30	5.18	6.46	6.46	3.30	11.20	12.49	N/A	N/A	N/A	N/A	9.09	10/01/2014
Blended Policy (Total Equity Exposure)	3.10	5.10	6.39	6.39	3.10	11.59	12.27	11.14	9.59	9.58	N/A	9.70	
Value Added	0.20	0.08	0.07	0.07	0.20	-0.39	0.22	N/A	N/A	N/A	N/A	-0.61	
<b>Total Fixed Income Composite (hedged)</b>	-0.42	1.01	1.21	1.21	-0.42	4.35	6.25	5.64	7.68	6.45	6.41	6.59	07/01/1998
Blended Policy (Total FI)	0.05	0.24	-0.34	-0.34	0.05	1.20	4.33	3.17	5.76	5.07	5.38	5.57	
Value Added	-0.47	0.77	1.55	1.55	-0.47	3.15	1.92	2.47	1.92	1.38	1.03	1.02	
<b>Real Assets (unlevered/hedged)</b>	0.78	4.61	3.39	3.39	0.78	6.28	6.95	N/A	N/A	N/A	N/A	3.35	10/01/2014
Blended Policy (Real Assets) (Hedged)	0.21	3.75	2.90	2.90	0.21	5.69	5.89	N/A	N/A	N/A	N/A	2.86	
Value Added	0.57	0.86	0.49	0.49	0.57	0.59	1.06	N/A	N/A	N/A	N/A	0.49	
<b>Risk Parity Composite (vol adjusted)</b>	0.34	1.54	-0.94	-0.94	0.34	3.40	7.37	5.27	N/A	N/A	N/A	3.64	10/01/2012
Blended Policy (Risk Parity)	0.07	-0.19	-1.89	-1.89	0.07	2.73	7.89	5.55	8.19	8.66	9.07	4.05	
Value Added	0.27	1.73	0.95	0.95	0.27	0.67	-0.52	-0.28	N/A	N/A	N/A	-0.41	
<b>Total Absolute Return</b>	0.93	1.31	3.45	3.45	0.93	4.88	3.83	4.01	5.98	N/A	N/A	5.20	10/01/2005
Blended Policy (3-month Libor + 3.5%)	1.46	2.93	4.32	4.32	1.46	5.61	4.80	4.94	6.35	6.90	7.17	6.73	
Value Added	-0.53	-1.62	-0.87	-0.87	-0.53	-0.73	-0.97	-0.93	-0.37	N/A	N/A	-1.53	

\*The indicated index in parenthesis of Blended Policy represents current benchmark. Description of Blended Policy is provided in Appendix of this report

Past performance is not necessarily indicative of future results. Please refer to the Notes section for disclosures related to the performance calculation methodology within this performance report. Additionally, please refer to the Appendix for referenced benchmark index definitions. Indices cannot be invested in directly. Unmanaged index returns assume reinvestment of any and all distributions and do not reflect fees or expenses.