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Rhode Island SIC

2016Asset Liability Review

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July 13, 2016

Rhode Island Asset Liability Review Calendar

	Topic	Date
1	***Liabilities Briefing***	*May 25, 2016*
	a. Review of liability profile and other actuarial considerations	
2	***Benchmarking Briefing***	*June 22, 2016*
	a. Peer institutional fund review b. ERSRI Plan asset portfolio review c. PCA Briefing on how the model works	
3	***Risks and Risk Preferences***	*July 13, 2016*
	a. Financial condition of plan b. Risk sensitivities and definitions of success	
4	***Translating Risk Appetite into Investment Constraints***	*Aug 1, 2016*
	a. Define investment objectives and determine model variables b. New concept review (asset class)	
5	***Asset Class Modeling***	*Aug 1, 2016*
	a. Role of assets b. Capital market assumptions	
6	***First Run of Model***	*Sept 8, 2016*
	a. Model output review - SIC feedback b. Issues for further review	
7	***Second Run of Model***	*Sept 28, 2016*
	a. Model output review	
8	***Adoption of Strategic Asset Allocation***	*Sept 28, 2016*

Today's Discussion

Investment Challenge

Employees Retirement System of Rhode Island (ERSRI)

- Risk is primarily managed strategically
- Publicly-traded stock and bond portfolios are primarily managed to provide market exposure

	Policy Allocation (%)	Rebalancing Range (%)
Global Equity	38%	+/- 2%
HF - Equity	8	+/- 2%
Private Equity	7	+/- 2%
infrastructure	5	+/- 2%
Real Estate	8	+/- 2%
Credit / TIPS	9	+/- 2%
Real Return HF	7	+/- 2%
Fixed Income	15	+/- 2%
Cash	3%	+/- 2%
Total	**100%**	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
60	7.5	- 5%
Lower than average	Average	Higher than average

Defined Benefit Plan Funding Math

$$C + I = B + E$$

Contributions + Investment Earnings = Benefit Payments + Expenses

- Benefit Payments are known and relatively easy to forecast
- Investment Earnings are variable and difficult to forecast
- Over the past two decades ERSRI's plan sponsors have always funded the ARC / ADC

Source of Benefit Payments for the Average Public Pension Plan over the past 30 years

Investment Return	64%
Employer Contribution	24%
Employee Contribution	12%

Source: U.S. Census Bureau

ERSRI Plan Revenues and Expenditures

- The red bars reflect investment gains and losses, which vacillate as financial markets fluctuate.
- Blue bars indicate contributions, from employees and employers, and green bars show benefit payments.
- Growth in levels of contributions and benefits is mostly stable and predictable over time.
- Investment earnings, **comprising over 56% percent of plan revenues** over the past seventeen years, fluctuate depending on market performance. In a low expected return environment – investment earnings as percent of revenues could decline.

C + I = B + E

Source: GRS

Risk in the Asset Liability Framework

Asset Liability Analysis:

Risk:

- Sharp increase in cost as a % of payroll (cost variability)
- Deterioration of plan funded status

- Analysis focused on scenario analysis , range of outcomes with analysis of worst case scenarios
  - Probability of
    - Return < 7.5%
    - Funding ratio falling below 50% over the next 30 years
    - Cost increase to 30% of payroll

Asset Allocation Analysis:

Risk:

- Volatility of asset returns (standard deviation of returns)
- Value at risk
- Downside deviation
- Return Drawdown
- Liquidity

- Analysis focused on risk-adjusted returns
  - Identify portfolios that minimize risk while seeking to achieve the actuarial target return

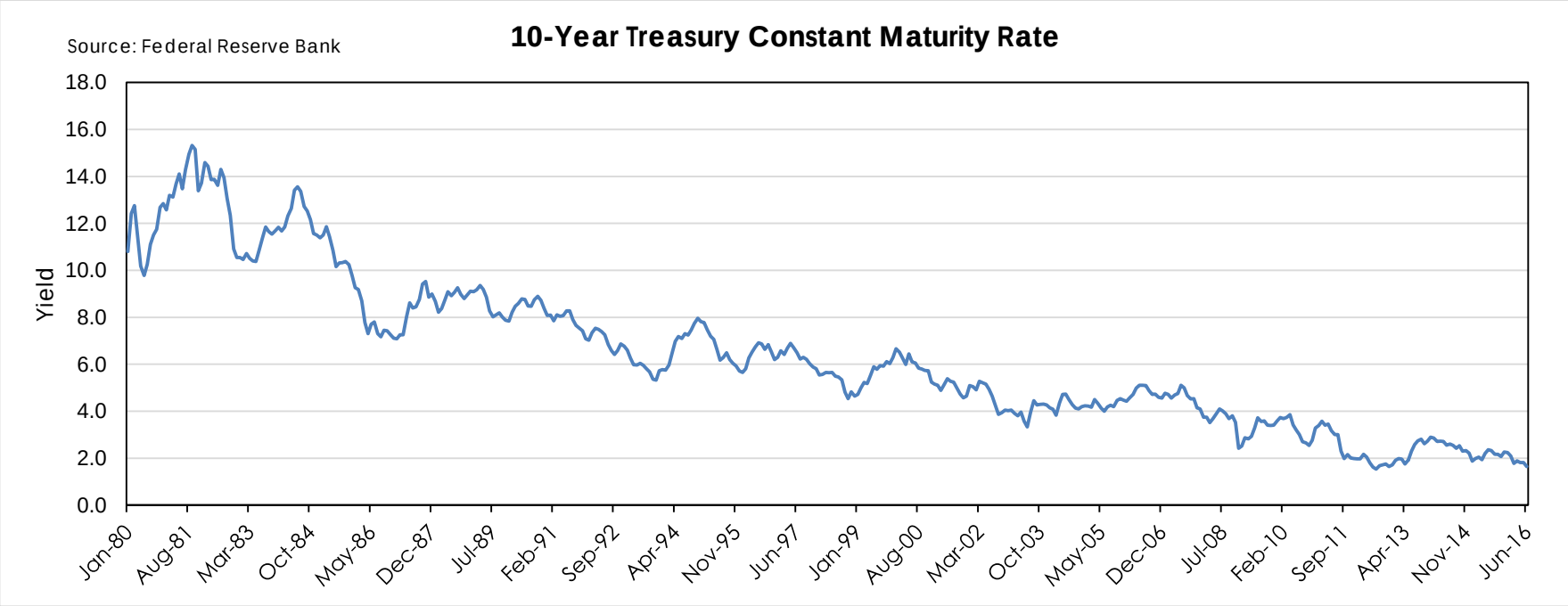
Low Expected Return Environment For All Savers

The current investment environment very challenging for long-term institutional investors

- Historically low(and negative in some geographies)level of interest rates
- Central banks' monetary policy appears to have reached the end of its effectiveness in stimulating economic growth and risk assets,
- Abnormally low level of economic growth around the world,
- Relatively high levels of equity valuations, and
- Unusually high level of political uncertainty that exists globally

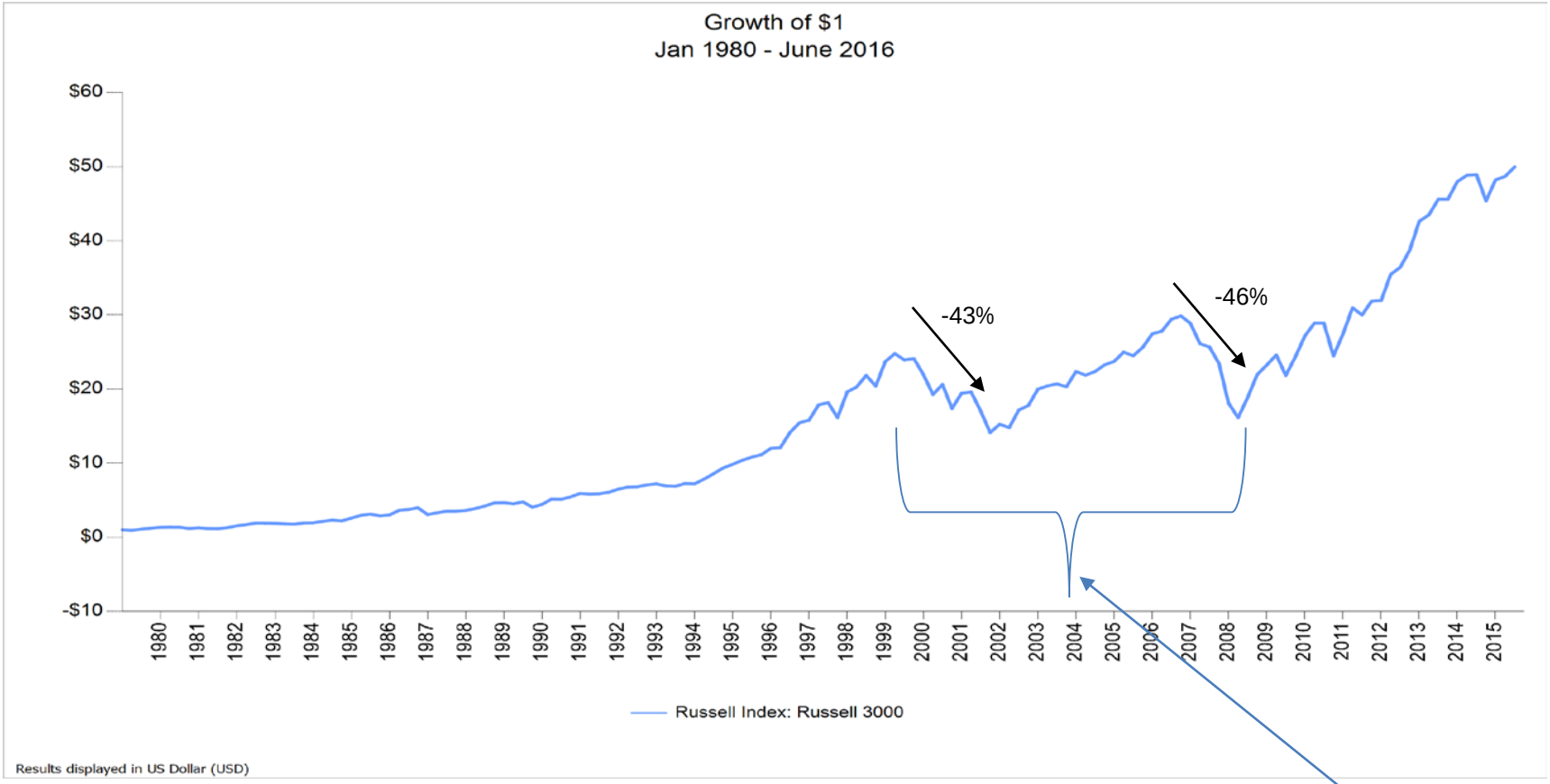
These factors are reflected in intuitional investors' 10-year capital market return expectations.

U.S. Treasury 10-Year Interest Rate



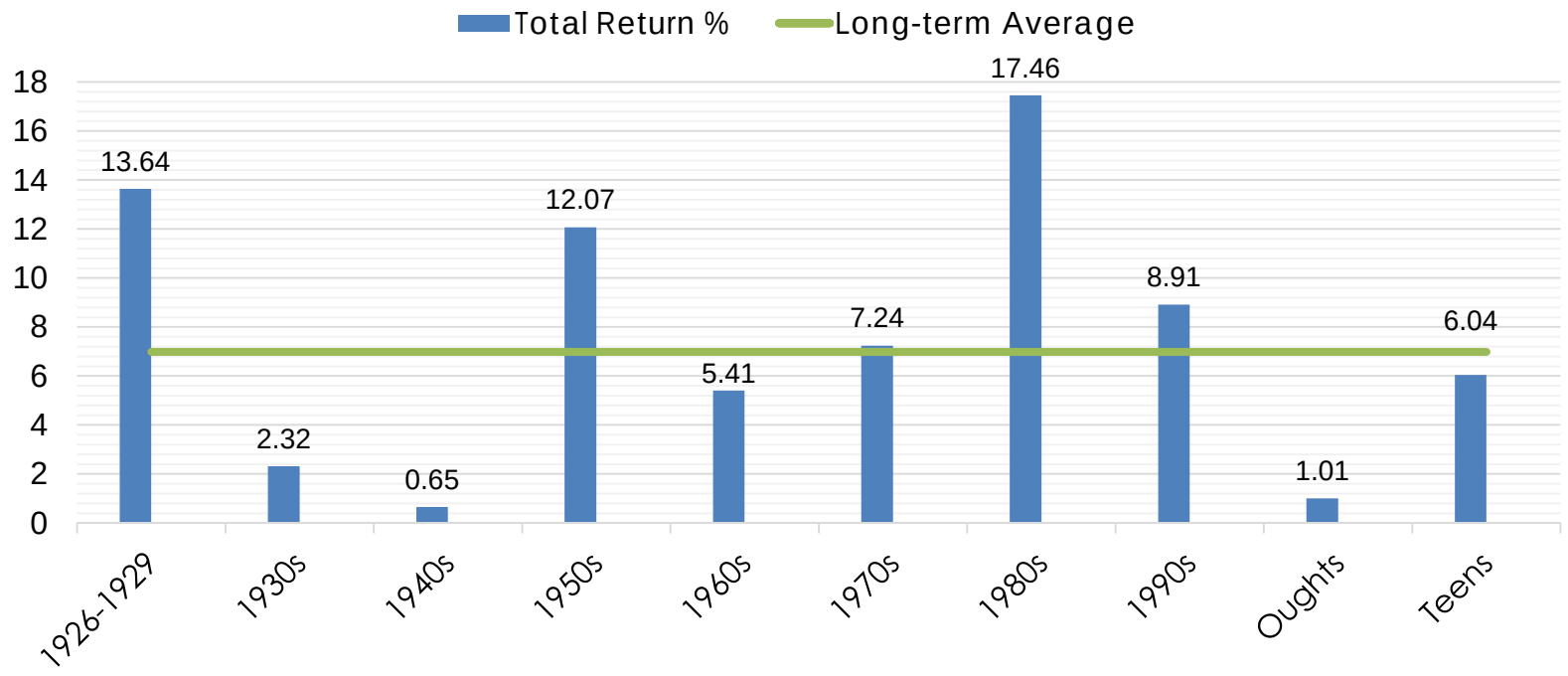
- Bond market yields are at historic low levels (negative in some non-U.S. markets !!)
  - 10-year U.S.T. yield to maturity (July 5, 2016 1.37%)
- Falling interest rates were a tailwind for investors for the past 30 years
  - This is not the case going forward (they may be a headwind)
- Interest rates are the building block for all other capital market returns
  - Low yields portend low capital market returns

U.S. Equity Market: Good Long-term Returns Entail Risk



- Equity investors are rewarded with high returns in the long term
- However, Equity Investors experienced two "once in a hundred year" negative events in a 10-year period

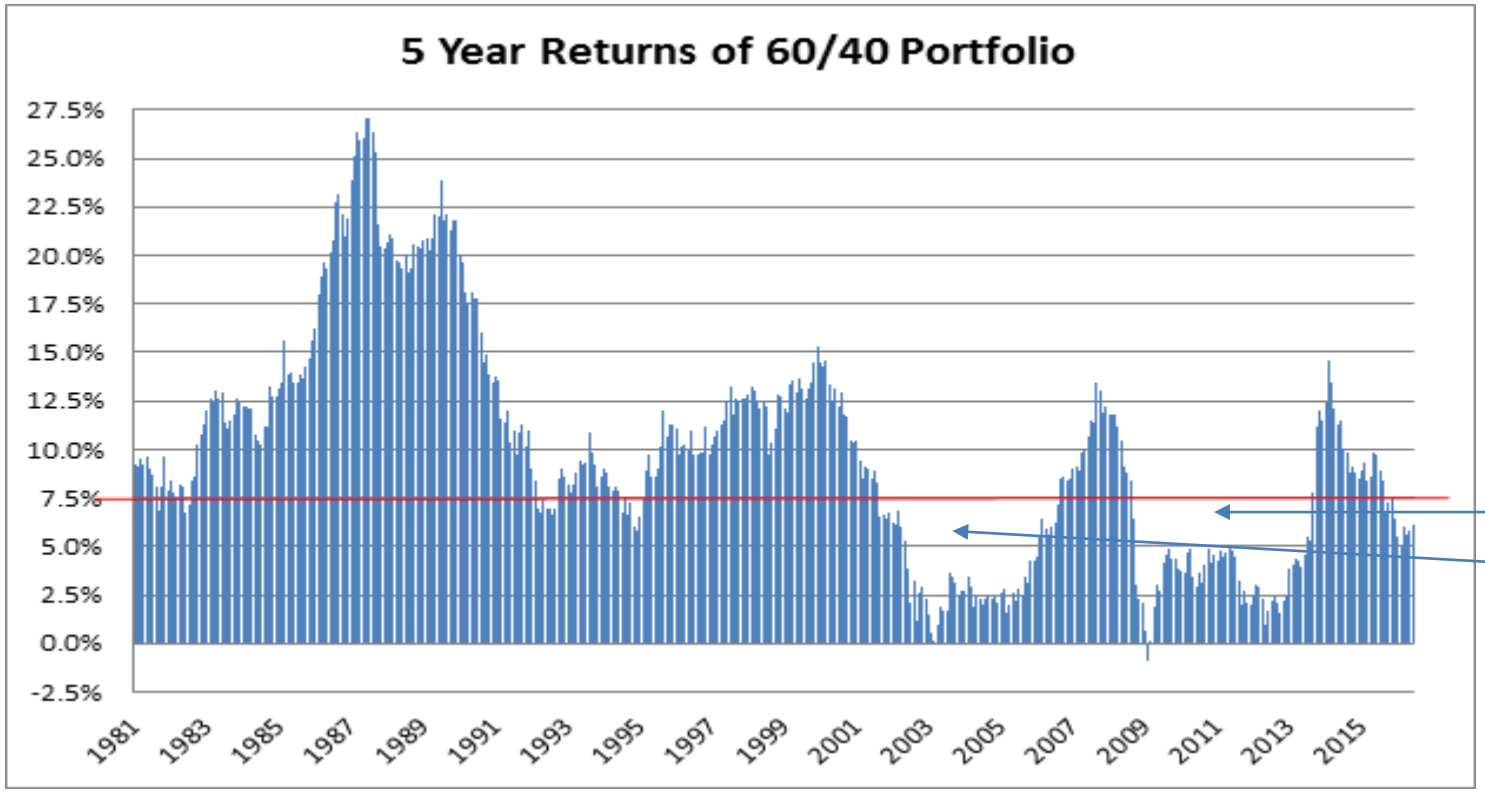
Global Equity & Bond Returns (1926 – 2016)



- 60% global equity / 40% global bonds portfolio
- Investors are usually rewarded for taking investment risk; however returns are variable

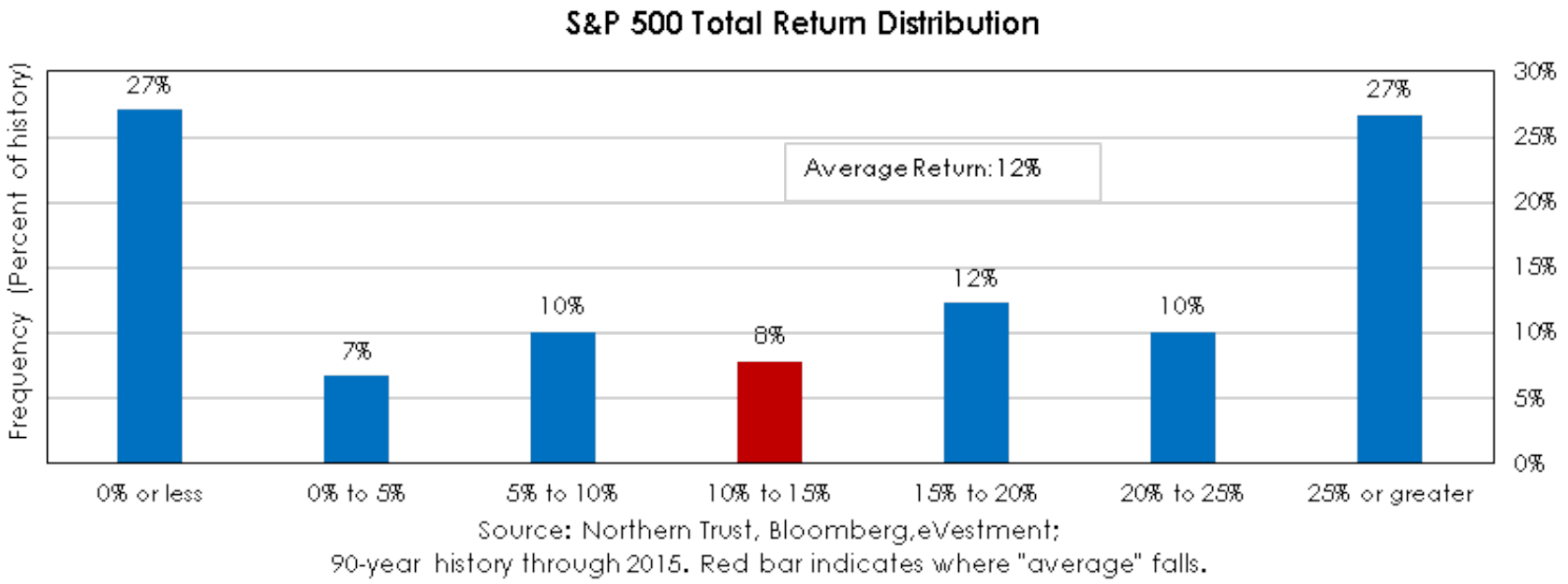
Data source: BONY Mellon

60 / 40 Portfolio Returns



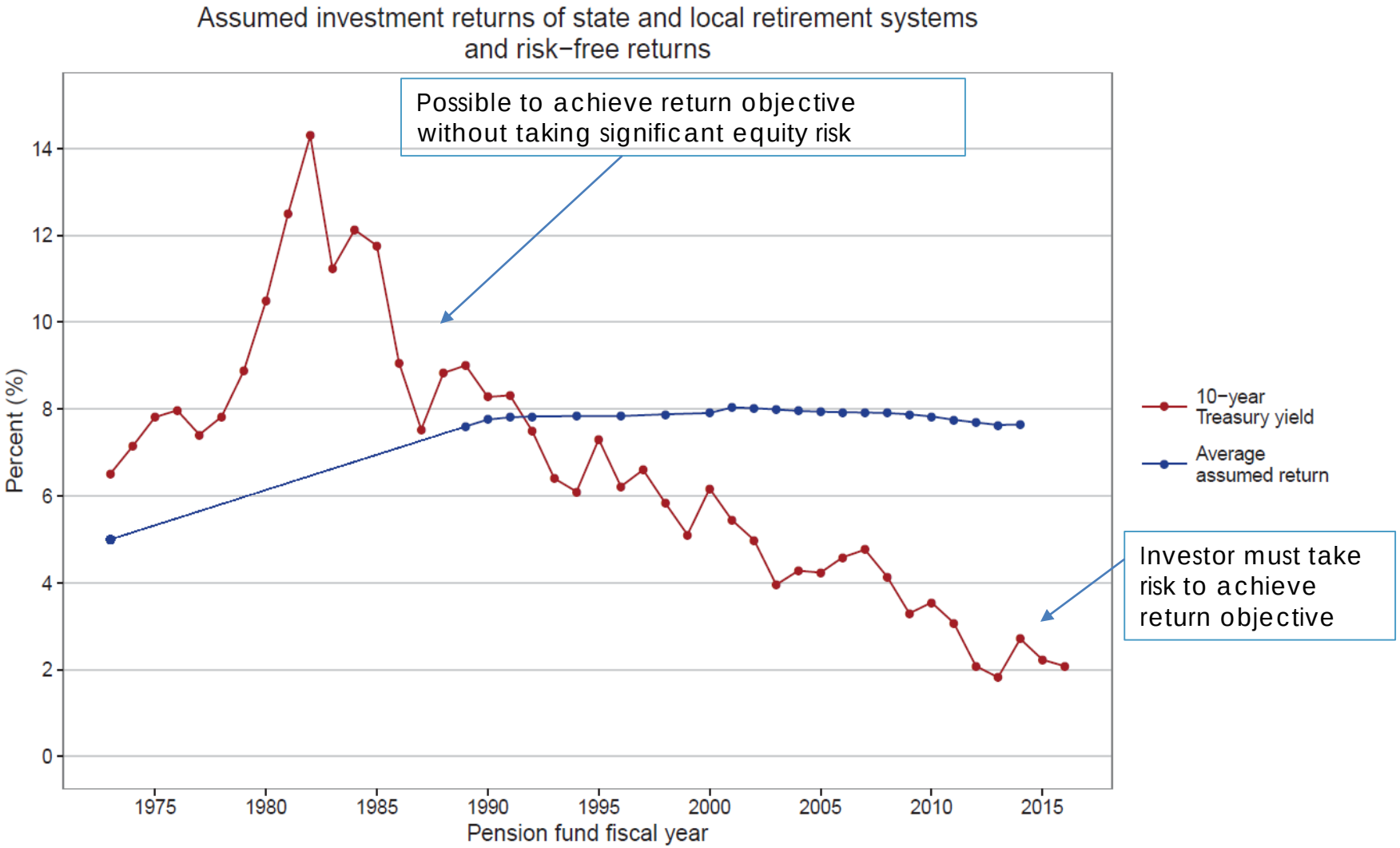
- Investors are usually rewarded for taking investment risk; however returns are variable

Equity Market Returns are Rarely "Average"



- Long-term investors face a bumpy ride to capture the equity return premium

DB Plans Must Take Risk to Achieve Their Actuarial Return Targets



Source: Public Pension Funding Practices Report 2016
- Rockefeller Institute of Government State University of New York

Risk is Not Always Rewarded – Even Over Longer Periods

20-Years ending 6/30/2016				
	Average Return	Compound Return	Standard Deviation	Return/Risk
Global Equity	7.2%	6.1%	15.9%	0.38
Fixed Income	5.8%	5.7%	3.4%	1.65
60/40	6.6%	6.3%	9.6%	0.65
70/30	6.8%	6.3%	11.2%	0.56
80/20	6.9%	6.2%	12.8%	0.49

Reaching for return is not always rewarded

Equity volatility can reduce a portfolio's efficiency

- Large equity allocations introduce return volatility to the portfolio
- Volatility has negative impact on compounded returns

ERSRI Net External Cash Flow (2016-2024): Deterministic

	Negative External Cash Flow ($ mil)	Market Value Assets ($ mil)	Net External Cash Flow %
FY 2016	$403	$7,550	5%
FY 2017	393	7,698	5%
FY 2018	386	7,868	5%
FY 2019	385	8,058	5%
FY 2020	389	8,263	5%
FY 2021	389	8,480	5%
FY 2022	397	8,712	5%
FY 2023	392	9,219	4%
FY 2024	387	9,509	4%

In $ terms – net negative external cash flow is very steady

Modest decline as a % of assets – assuming asset portfolio appreciates at a steady rate

- Assumes asset portfolio grows at actuarial return target rate

Source: GRS

Net Negative External Cash Flow: Investment Implications

Large net negative external cash flow (ERSRI ~ -5%) per year may reduce a mature DB plan's management flexibility

Large negative market movements (drawdowns) are particularly harmful to plan solvency for mature funds

- Under the worst case scenarios, investors are forced to liquidate long-dated assets in down markets or are forced sellers of illiquid assets – at price concessions
- Net cash outflows are assets not available to invest in lower valuation assets and represent an opportunity cost if financial markets rebound
- Negative market returns could cause a Plan's funding ratio to drop to unsustainable levels where the plan can not recover in the long-term

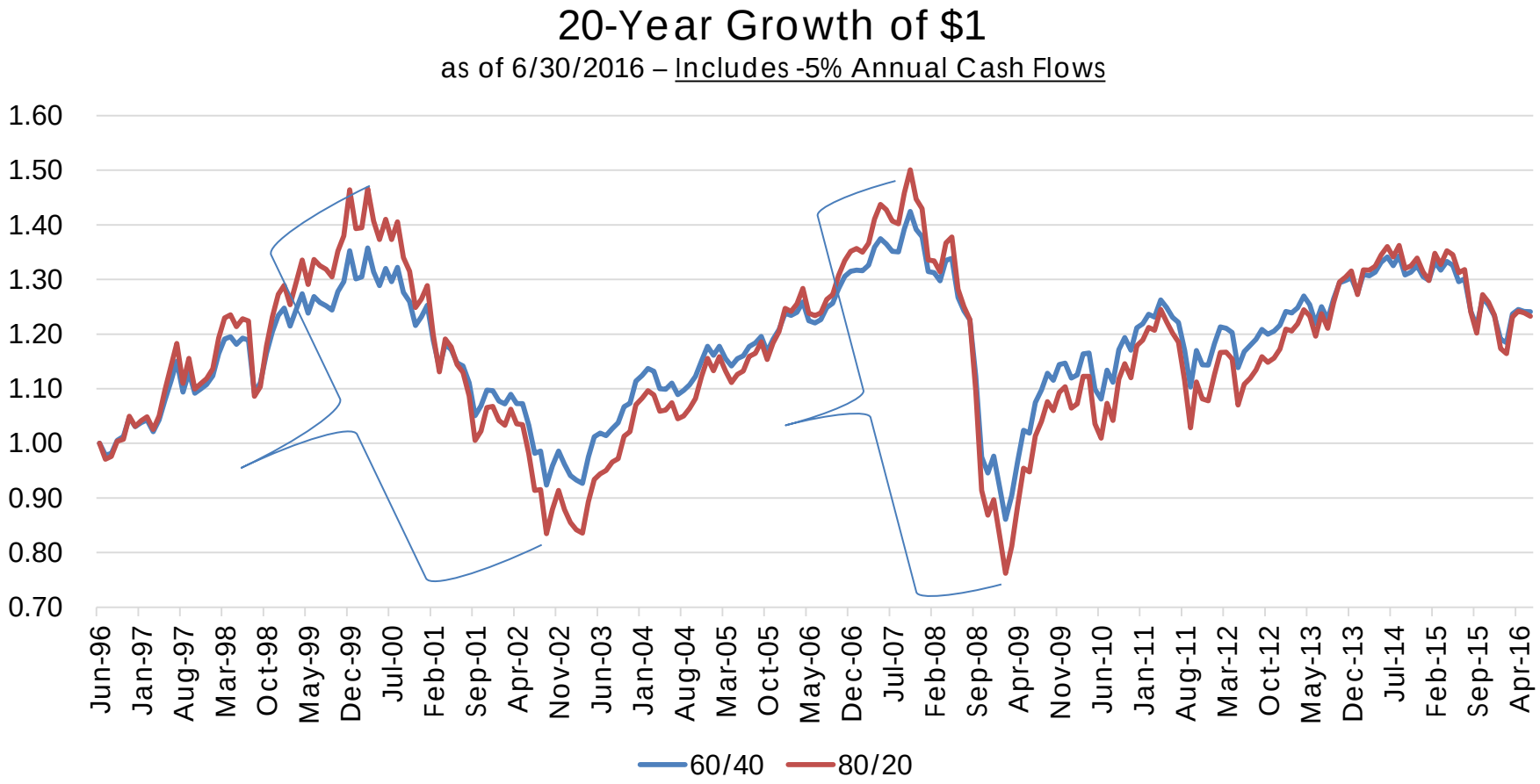
Net Negative External Cash Flow: Investment Implications

Given that portfolio returns are volatile and the plan anticipates a large net negative external cash flow for the next decade (at least):

- Achieving the actuarial return target on average may not be sufficient – even if ADCs are made – to maintain plan sustainability
  - Compounded returns are what matter
- Since the portfolio is vulnerable to large negative equity market movements, the investor's ability to take risk may be constrained

The asset liability review will address these issues

Historical Traditional Mix Portfolio Outcomes



- Equities drive investment results in traditional portfolios
- Net negative cash flows have a significant impact on portfolio valuation in negative market environments
- A more diversified portfolio including illiquid investment assets would likely have produced better results

Net Negative External Cash Flow and Volatile Returns

	Mature Plan					
	Stable Market			Volatile Market		
	Return	Value	Annual Payout	Return	Value	Annual Payout
		$100			$100	
Year 1	-6%	$89	-$5	-20%	$76	-$5
Year 2	14%	$96	-$5	24%	$88	-$5
Year 3	4%	$95	-$5	6%	$88	-$5
Year 4	8%	**$97**	-$5	10%	**$91**	-$5
Average return	**5.0%**			**5.0%**		
Compound return	4.7%			3.7%		
Standard Deviation	8.4%			18.4%		

Volatile markets have adverse effects on portfolio value when combined with net negative cash flows

Volatility reduces compounded return

Summary:

- The asset liability review will explore the trade-offs (contributions, funding levels, investment risk and return) policy-makers face to provide retirement security for ERSRI active members and beneficiaries
- In the current investment environment institutional investors must assume significant investment risk (volatility) in seeking to achieve the actuarial return target
- The desire to achieve the return target must be balanced against the negative impact that large negative capital market returns can have on the Plan's sustainability
- The asset liability review will analyze how capital market return volatility could impact plan financial health in the near and long-term given the Plan's funding level and large net negative external cash flow

Appendix:

Modeling Terms

Arithmetic Returns

- Sum of annual returns divided by the number of annual returns
- Also know as simple average
- Average return in any given year

Geometric Returns

- The average of a set of products defined as "the 'n'th root product of 'n' numbers",

$$\{\text{Return } 1 \times \text{Return } 2 \times \ldots \text{Return } n\}^{\frac{1}{n}}$$

- Where 'n' represents the number of returns in the series
- Also know as average compounded returns
- Total annual return over the entire holding period
- Value is negatively impacted by return volatility (standard deviation)

Risk in the Asset Liability Framework

- Standard Deviation: A measure of a security's stability over a given period of time. While there are various ways to calculate it, the most common way is to compute the average deviation from the average price over the period of time one wishes to measure. Generally, securities with a higher historical volatility carry more risk.

- VaR (Value at Risk): A measure of the potential loss in value of a risky asset or portfolio over a defined period for a given confidence interval. It is used to capture the potential loss in value of a portfolio from adverse market movements over a specified period.

- Downside Deviation: Downside deviation is a risk statistic measuring volatility. It is a measure of downside risk that focuses on returns that fall below a minimum threshold or minimum acceptable return.

- Return Drawdown: The gradual decline in the price of a security or other investment between its high and low over a given period. A drawdown is measured from the time a retrenchment begins to when a new high is reached. This method is used because a valley can't be measured until a new high occurs. Once the new high is reached, the percentage change from the old high to the smallest trough is recorded. Drawdowns help determine an investment's financial risk.

- Liquidity: Liquidity describes the degree to which an asset or security can be quickly bought or sold in the market without affecting the asset's price.

- Efficient Frontier: The efficient frontier is the set of optimal portfolios that offers the highest expected return for a defined level of risk or the lowest risk for a given level of expected return. Portfolios that lie below the efficient frontier are sub-optimal, because they do not provide enough return for the level of risk. Portfolios that cluster to the right of the efficient frontier are also sub-optimal, because they have a higher level of risk for the defined rate of return.

Risk in the Asset Liability Framework

- Sharpe Ratio: A measure of a portfolio's excess return relative to the total variability of the portfolio. The Sharpe ratio indicates whether a portfolio's returns are due to smart investment decisions or are a result of excess risk. The greater a portfolio's Sharpe ratio is, the better its risk-adjusted performance has been.
- Funding Ratio: The ratio of a pension plan's assets to its liabilities. A funding ratio above 1 indicates that the pension or annuity is able to cover all payments it is obligated to make.
- Cost as a Percent of Payroll: A measure of pension contributions as a weight of payroll expense.
- Monte Carlo Simulation: Model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables such as future capital market returns. The process simulates multiple outcome paths of a series of random events.

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