

A stylized, layered mountain range in various shades of blue and grey, set against a light blue sky. The mountains are rendered in a flat, graphic style with soft gradients.

2016 Asset Liability Review

Institutional Investors'
Investment Management
Paradigms

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 Management Paradigms

Objective:

Review how other institutional investors are structuring their portfolios to achieve their investment objectives

Comparison of funds' investment philosophies and investment strategies that may identify portfolio structures, strategies or practices that are consistent with ERSRI investment objectives

- Achieve return targets in a low interest rate environment
- Manage risk
 - Strategically
 - Dynamically
- What are industry thought leaders doing?

Investment Management Paradigms

Investment Philosophies / strategies employed by:

- Public DB plans
 - Also, benchmark to plans with similar characteristics as ERSRI
 - Other PCA public fund DB clients
- Corporate DB plans
- Foundation and Endowment Plans (F&E)
- Multi-asset products – designed to generate 5% real return
- Academia

Investment Management Paradigms

Comparisons caveats:

- Direct comparison of identical plans is limited. Most plans vary by:
 - Size (Asset portfolio market value)
 - Management resources – investment staff size
 - Actuarial return target
 - Funding level
 - Net external cash flow (benefits less contributions)
 - Actuarial policies
- Philosophy / strategy that is right for plan A many not be right for plan B
- Public pension plans tend to herd – asset allocations are relatively similar and the primary source of return volatility is the same – public equity
 - This is surprising given the wide dispersion in plans' financial health, actuarial policies, investment environment and plan sustainability challenges they face

Investment Management Paradigms

Examine how Institutional Investors structure the asset portfolio to achieve their investment objectives:

- Identify the legs of the asset portfolio stool
 - How does the investor define the return premia they are looking to capture and risks in the asset portfolio they have to manage?
- Investment philosophy to generate return and manage risk
 - Strategic asset allocation
 - Asset (functional) class structure
 - Mix of assets / strategies
 - Manager selection
 - Manager alpha
 - Dynamic risk management
 - Risk is managed over the course of an investment cycle
- Strategic asset allocation has the largest impact on achieving investment objectives (in the asset portfolio context).

Investment Paradigms

Equity-Centric Philosophy

Underlying investment belief: Equity will outperform Fixed Income in the long term

60/40 Structure

- Return seeking portfolio
 - Equity
- Risk reducing portfolio
 - Fixed Income

60 / 40 with Illiquids

- Equity
 - Public
 - Private
 - Private Equity
 - Private Real Estate
- Fixed Income

Return seeking - Risk-focused

- Equity
 - Public
 - Non-directional strategies
 - Private
 - Private Equity
 - Private Real Estate
- Fixed Income
 - Non-directional strategies

Less diversified

More diversified

These structures cover 90%+ of all public pension funds
Equity (growth) risk is the largest portfolio risk

Investment Paradigms

Risk-Balanced Philosophy

Underlying investment beliefs:
Risks should be balanced;
Low correlated assets will reduce risk in the long-run.
The portfolio will benefit from compounding fewer large negative returns.

Risk-balanced approach – investment risk

Diversify across sources of risk

- Growth
- Interest rate
 - With leverage
- Other

Risk-balanced approach – economic risk

Diversify across economic regime

- Strong economic environment
- Recession
- Inflation

Although theoretically sound and implementable in scale, few public funds employ these approaches for their whole portfolio.

Some plans do have allocations to risk balanced products (typically risk parity products).

Public Fund Investment Paradigms Review

Risk Mitigation Approaches Employed

- Diversification
- Dynamic risk management
 - Asset class level
 - Active
 - Rules-based
 - Asset class structure
- Low volatility / high Sharpe ratio strategies (hedge fund structures)
- Managed volatility strategies
 - Low beta equity
 - Currency risk overlay
- Risk mitigation functional class (Crisis Risk Offset)
 - Portfolio of strategies designed to perform well in an equity market crisis environment and provide reasonable returns in other market environments
- Explicit tail-risk hedging strategies
- Risk balanced approach – reduce equity risk / lever fixed income risk (risk parity)
 - Multiple approaches
- Rebalancing policy
- Combination of all of the above

Public Fund Investment Paradigms Review

Other Policies Employed

- Large allocation to illiquid assets, primarily for return generation
- Strategic partnerships with multi-asset investment firms: 5% real return target

Benchmarking: Public DB Plans

Employees Retirement System of Rhode Island (ERSRI)

- Risk is managed strategically; no dynamic risk management
- Rebalancing bands are narrow
- Focused on improving portfolio Sharpe ratio (return per unit of risk)
- No explicit tail risk strategies
- Publicly-traded stocks and bond are primarily beta portfolios (small expected alpha)
- Large allocation to Hedge Fund strategies

	Policy Allocation (%)	Rebalancing Range (%)
Global Equity	38%	+/- 1%
HF - Equity	8	+/- 1%
Private Equity	7	+/- 1%
infrastructure	5	+/- 1%
Real Estate	8	+/- 1%
credit / TIPS	9	+/- 1%
Real Return HF	7	+/- 1%
Fixed Income	15	+/- 1%
Cash	3%	+/- 1%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
60	7.5	- 5%

Paradigm: Risk focused; protection in down markets

ERSRI portfolio similar to **Utah Retirement System** in philosophy and structure

Benchmarking

Objective:

- Examine public DB plans with similar characteristics to ERSRI to see how they define and manage risk through their investment philosophy and asset portfolio structure

Public DB Plans with similar characteristics as ERSRI

	Expected return (%)	Funding Ratio (%)	Net Cash Flow (% of Assets)	Market Value ('000)
Alabama ERS	8.0	67	-3.6	10,134,581
Alaska PERS	8.0	60	-2.2	7,731,438
Arizona Public Safety	7.5	49	-1.1	6,018,000
Chicago Teachers	7.8	52	-5.0	10,045,543
Kentucky County	7.5	62	-2.3	8,084,774
Michigan SERS	8.0	62	-4.3	9,961,903
New Hampshire Retirement	7.75	61	-1.4	6,700,000
ERSRI	7.5	60	-4.5	7,500,000

- Note: Kentucky County is part of the KY Retirement Systems that totals ~ \$11 billion. Most asset are managed in one pool.
- Alaska Employee is a part of the Alaska PERS which includes Teachers. All asset are managed as one pool.

Public Fund FY 2015 Returns

	FY 2015 (Ended June 30)	3 Year Annualized	5 Year Annualized	10 Year Annualized
ERSRI	2.22%	9.33%	9.77%	6.05%
Arizona Public Safety	3.68	9.22	8.69	N/A
Kentucky County	2.01	9.32	9.18	6.05
New Hampshire RS	3.50	11.70	11.60	6.90
Alabama ERS*	N/A	N/A	N/A	N/A
Alaska PERS	3.29	11.27	10.89	N/A
Chicago Teachers	3.50	11.60	11.70	6.60
Michigan SERS*	2.60	10.00	10.00	6.60

Note: Alabama FY Ended Sep 30

Source: Plan 2015 CAFRs

Alabama ERS

- Alternatives include Private Equity / Private Debt, Hedge Funds
- 60% in public equity is higher than average
- Although, Private Equity allocation is low
- U.S. centric public equity portfolio structure
- Traditional public equity-centric investment philosophy

Asset Class	Target Allocation	Target Range
Domestic Equity	45%	30%-60%
International Equity	15%	10%-25%
Fixed Income	17%	10%-50%
Alternative Investments	10%	0%-15%
Real Estate	10%	0%-15%
Short-term investments	3%	0%-7%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
67	8	-3.6

Paradigm: Traditional long-term investor philosophy, focused on public equity return premium

Alaska PERS

- Public Equity portfolio is globally balanced
- Wide rebalancing bands
- Unique real assets portfolio structure
 - 50% NCREIF Property Index
 - 15% Barclays TIPS Index
 - 10% NCREIF Farmland Index
 - 10% NCREIF Timberland Index
 - 5% FTSE NAREIT All Equity REIT Index
 - 10% S&P Global Infrastructure

Asset Class	Target Allocation
Domestic Equities	26%
Global Equities ex-U.S.	25%
Alternative Equity Strategies	3%
Private Equity	9%
Real Assets	17%
Fixed Income	12%
Absolute Return	5%
Cash Equivalents	3%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
60	8.0	-2.2

Paradigm: Traditional long-term investor philosophy with emphasis on illiquidity premium

Arizona Public Safety Personnel Retirement System

- Portfolio broadly diversified across multiple sources of return(10 separate asset classes.)
- Expect diversification to help capture most of strong positive markets and to protect from the worst of devastating negative markets.
- Focused on reducing return volatility and increasing efficiency (Sharpe ratio)

Asset Class	Target Allocation
U.S. Equity	17
non-U.S. Equity	14
Private Equity	13
Fixed Income	10
Credit	8
Absolute Return	4
GTAA	9
Real Assets	7
Real Estate	11
Risk Parity	3
Cash	4
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
49	7.5	-1.1

Paradigm: Risk focused; protection in down markets

Chicago Teachers Retirement System

Asset Class	Target Allocation
U.S. Equity	31%
Global ex-U.S. Equity	31%
Private Equity	5%
U.S. Fixed Income	23%
Cash	0%
Private Real Estate	9%
Infrastructure & other Real Assets	2%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
52	7.8	-5.0

Paradigm: Traditional long-term investor philosophy, focused on public equity return premium

- Public equity portfolio is globally balanced
- Strategic allocation managed close to policy target

Kentucky County Employees Retirement System

- To achieve the expected return target board elected to take additional equity risk (global equity allocation is increasing)
- Public Equity portfolio is global balanced
- Tight rebalancing range +/- 1%
- Hedge Fund allocation is absolute return based

Asset Class	Target Allocation
Global Equity	53%
Global Fixed Income	12%
Real Estate	5%
Inflation-Sensitive Assets	8%
Hedge Funds	10%
Private Equity	10%
Cash	2%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
62	6.8	-2.3

Paradigm: Traditional long-term investor philosophy, focused on equity return premium; some additional diversifying strategies

Michigan SERS

Investment Objective

- Provide a completely diversified fund utilizing various management and style strategies that will provide downside market protection with upside market participation
- Generate reasonable growth and income while minimizing market volatility
- Investing in today's financial markets is becoming increasingly complex as result of the rapid exchange of information, increased volatility and global interconnectedness. Capital preservation is paramount — avoiding losses is more important than achieving gains
- Markets are inefficient — they are driven by human emotion which can be overcome by taking a contrarian, long-term perspective
- Volatility is not a true measure of risk, permanent impairment of capital or shortfall is risk
- Diversification is critical because the future is unknown
- Mean reversion drives everything — most investments go through cycles, and cycles imply reversion
- The focus should be on risk-adjusted returns — returns cannot be evaluated without considering the risk taken to achieve those returns

Asset Class	Target Allocation
U.S. Equity	28%
International Equity	16%
Private Equity	18%
Absolute Return	6%
Real Estate / Infrastructure	10%
Real Return / Opportunistic	10%
Cash & Short Duration Fixed Income	2%
Core Fixed Income	11%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
62	8.0	-4.3

Paradigm: Risk diversifying approach with emphasis on illiquidity premium; dynamic risk management

- U.S.-centric public equity portfolio structure
- Large allocation to Private Equity
- Minimal Fixed Income allocation

New Hampshire Retirement System

- Invest in a mix of investments, by asset class, which is expected to produce the return required to meet future funding requirements at the lowest level of risk, given all of the assumptions made and employing a mean-variance optimization)

Asset Class	Target Allocation	Allocation ranges
Domestic Equity	30%	20 - 50%
Non-U.S. Equity	20%	15 - 25%
Fixed Income	25%	20 - 30%
Real Estate	10%	5 - 20%
Alternatives	15%	5 - 25%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
61	7.75	-1.4

Paradigm: Traditional long-term investor philosophy – some additional diversifying strategies

Institutional Investors

- Corporate DB Plan Model
- Traditional Long-Term Investor Model
- F&E Model
- Canadian Model
- Danish Model

Corporate DB Plan Model

- Most corporate DB plans are closed to new members.
- Many firm's primary DB plan management considerations are driven by regulation and accounting rules.
 - Corporate DB plan funding volatility impacts cash flow and company earnings.
 - FASB 158 requires discounting of future benefit obligations at a current interest rates.
- As a result, company management is motivated to “de-risk” the portfolio relative to the plan's liabilities – thus focusing on Liability Driven Investment Strategies (LDI).
- The appeal of a liability-driven investing program to a plan sponsor is the ability to reduce or hedge risk by aligning investment programs with future retirement benefits promised to plan participants.
- LDI strategies match a stream of liabilities with a stream of Fixed Income payments – effectively they match interest rate sensitivity of the asset portfolio with the plan's liabilities.
- More than half (57 percent) of corporate pension sponsors adopt some form of liability-driven investing, source: 2013 poll conducted by SEI.
 - Of those plan sponsors who use LDI, more than half (52 percent) invest at least 40 percent of their portfolio assets in a liability-driven program.
- Investment Objective: a gradual reduction in risk assets as the plan's funding ratio improves.
- Public DB plans are covered under different accounting rules than public DB plans – primarily using the assumed rate of return as the discount rate – and the ability to smooth market gains and losses.
- LDI approach is less attractive to public plan sponsors at current interest rate levels.

Traditional Long-term Investor Model

- Large public equity (growth risk) allocation
 - In asset weighting and contribution to portfolio volatility
- Philosophy driven by:
 - Equity outperforms Fixed Income in the long run
 - Liabilities are long term.... And equity is a long-term asset
 - The asset portfolio is not “matched” to the liabilities , and there is tracking error. But investors are compensate for equity risk in the long-term and the fund will be around for the long-term.
- Allocation is a Good / Fair weather portfolio (geared to good economic times)
 - Expectation is that this should not be a problem because global equity market returns are positive more often than negative
- Basis for a 60/40 portfolio philosophy (or 70/30)
- Still the primary public fund management philosophy / strategy paradigm

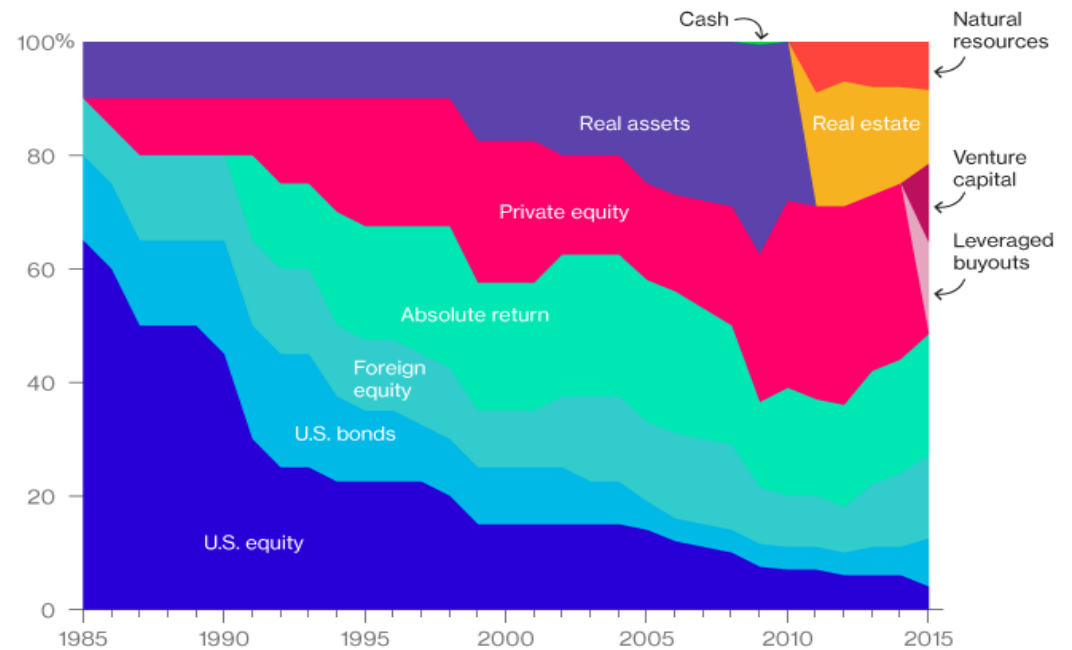
Foundation and Endowment Model: F&E

- Required to pay out 5% of fund assets per year – to maintain tax-exempt status.
- Well resourced (particularly largest, most visible funds)
- Most F&E are smaller (more nimble) than public fund DB plans
- Operate in private
- Foundations likely to have social mission – impact or mission investing
- Very long-term horizon
- Multiple investment approaches – but some similarities
- Large allocation to alternative investments – particularly illiquid assets
 - Private Equity / VC
 - Hedge funds
 - Access to top quality General Partners and strategies
 - Less fee sensitive than public funds

Yale Model

Yale endowment: \$27 Billion

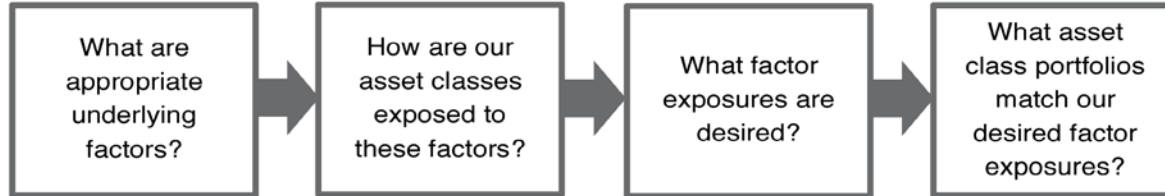
- David Swenson, CIO
- Well-resourced organization
- Broad asset diversification
 - Significant alpha from Private Equity / illiquid assets
 - Venture capital 10% of fund (\$4.2 billion !!)
 - LBO 16% of fund down from 24%
- Access to VC industry leaders
- Sector rotation
- First mover



Source: Bloomberg

Harvard Model

- “The core of our proposal is an assumption that our strategic asset allocation, as expressed through asset classes, can be conceived of as a combination of a chosen systematic “factor” portfolio and a non-systematic “residual” portfolio. By conceptually partitioning in this manner, we hope to focus on the principle drivers of our risk and return while at the same time accommodating a variety of desirable portfolios.”
- Factor-based investment approach:



- Very Diversified Approach
- Meaningful active decisions (i.e. 11% Emerging Markets Equity)
- Large allocation to illiquid strategies

Asset Class	Target Allocation
U.S. Equity	11%
Foreign Equity	11%
Emerging Market Equity	11%
Private Equity	18%
Absolute Return	16%
Natural Resources	11%
Public Commodities	0%
Real Estate	12%
Fixed Income	10%
Cash	0%
Total	100%

Ontario Municipal Employees (OMERS): Canadian Model

- Asset allocation across six strategic asset classes: fixed income, inflation-linked bonds, public equities, private equity, infrastructure and real estate.
- Private investments include holdings in infrastructure, private equity and real estate, which are selected specifically for their ability to provide more predictable returns and cash flows.
- Asset mix is based on the belief that over the long term, an allocation with exposure to private investments is well positioned to generate strong returns and consistent cash flow, with reduced risk to meet the Plan's funding requirements.
- Use leverage to enhance investment returns and expand diversification
- Invest globally, with assets diversified by asset class, geography, economic sector.
 - Diversify across types of income streams in order to earn long-term returns.
 - Target high-quality investments, which are resilient in times of economic stress.

Asset Class	Target Allocation	Target Range
Public Equities	36%	15% to 50%
Fixed Income	44%	20% to 75%
Inflation-Linked Bonds	16%	5% to 25%
Cash & Economic Leverage	-42%	
Private Equity	12%	8% to 18%
Infrastructure	22%	13% to 26%
Real Estate	14%	10% to 18%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
91.5	7%	N/A

Paradigm: Multi-asset investment company; special focus on illiquid assets; in-house management

- Well-resourced organization
- Internal management – conduct their own research, actively manage risk
 - Investment themes applied consistently throughout the portfolio
- Distinct split private / public assets
- Large allocation to private assets 48%

ATP: Danish Model

- Absolute return-based strategy
- Separate alpha and beta – very diversified portfolio (equity not a big %% allocation)
- Employ tail risk hedging – to insure Beta portfolio

Two primary portfolios

- Hedge liabilities portfolio – tied to liabilities
- Return-oriented portfolio (beta portfolio) – designed to deliver additional return

Manage five risk categories

- Credit – low quality bonds – corporate and EM
- Growth – public equity / private equity / VC
- Inflation protected-assets (TIPS, infrastructure, Real Estate)
- Commodities – energy, oil equities,
- Interest rates – government bonds / MBS

Dynamic risk management

- Mechanically applied if risk levels hit tolerance boundaries

Other Public DB Plans

San Bernardino County Employees' Retirement Association ("SBCERA")

- Objective: generate contractual income and position the portfolio for periods when it pays to be a liquidity provider. Focus on slow and steady returns
 - Income focused
 - Harvest beta (at good valuations) with overlay of swaps and futures

Asset Class	Target Allocation	Target Ranges
Domestic Equities	13%	8-18%
International Equities	15%	10-20%
U.S. Fixed Income	15%	10-20%
Global Fixed Income	18%	13-23%
Real Estate	9%	4-14%
Private Equity	16%	11-21%
Real Assets	5%	0-10%
Absolute Return	7%	2-12%
Cash	2%	0-10%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
81	7.5%	-1.9

Paradigm: Risk-focused, dynamic risk allocation and portfolio management

- Dynamic risk allocation – informed rebalancing tactically adjusted monthly
- Employs contrarian investment management style
- Established strategic alliances with best-in-class hedge fund managers allowing for nimble asset shifts among different strategies under the manager's umbrella without it being a brand new transaction
- Five-year ending 2014 met return target with one-third less risk than other public pension plans
 - Public equity portfolio is globally structured
 - Large allocation to illiquid assets (Private Equity and Real Estate)
 - Large allocation to Fixed Income

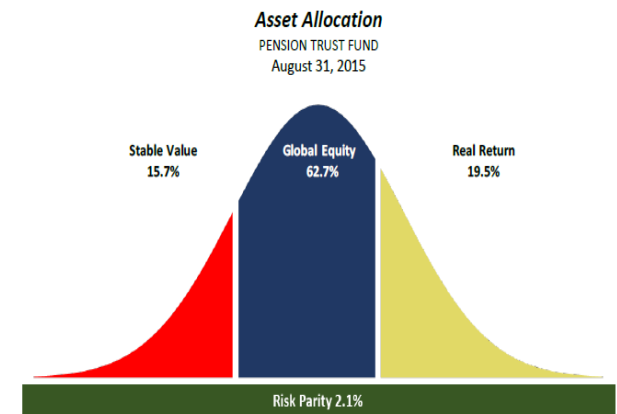
Teacher Retirement System of Texas

- Central strategy is comprised of a 57 percent allocation to global equity markets with structurally high allocations to both emerging markets and private equity. The remaining 43 percent is comprised of three additional strategies designed to diversify the total fund when either a deflationary or inflationary regime arises.

Asset Class	Target Allocation	Target Range
U.S. Equity	20%	13% - 23%
Non-U.S. Developed Equity	15%	8% - 18%
Emerging Markets Equity	10%	4% - 14%
Directional Hedge Funds	5%	0% - 10%
Private Equity	12%	8% - 18%
U.S. Treasuries	13%	0% - 20%
Absolute Return	0%	0% - 20%
Stable Value Hedge Funds	4%	0% - 10%
Global Inflation Linked Bonds	5%	0% - 8%
Real Assets	12%	11% - 21%
Energy and Natural Resources	2%	0% - 8%
Commodities	0%	0% - 5%
Cash	1%	0% - 5%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
80	8	-3.0

Paradigm: Multi-asset investment company; Economic regime based



- Diversified by economic regime
- Public equity portfolio is globally structured
- Large Emerging Equity allocation
 - Take big picture view – Europe is odd man out – so, are U.S. Equity centric
- Large allocation to real assets
- Very low Fixed Income allocation
 - “Unlevered debt is almost useless now as long term wealth accumulator”
- Employs several Strategic Partners - multi-product capabilities with 5% Real return target
- Strategic Partner with Private Equity firms to get access to deal and better term.
 - Purchased piece of Bridgewater

Missouri State Employee's Retirement System (“MOSERS”)

- Investment philosophy:
 - Shift from an approach where capital is allocated based on expected returns to one where capital is allocated based on expected risk and economic balance.
 - Belief that economic growth and inflation are the two most significant return drivers of the investments to be managed.
- Portfolio structure
 - Illiquid portfolio (20% allocation)– higher expected return than public markets
 - Remaining 80% of the capital to be managed using a risk-balanced approach (beta-balanced).

Asset Class	Target Allocation
Global Equities	9%
Alternative Betas	15%
Nominal Bonds	18%
Inflation Indexed Bonds	30%
Commodities	8%
Illiquid Investments	20%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
75	8.0	-3.7

Paradigm: Risk balanced

Missouri State Employee's Retirement System (“MOSERS”)

Beta-Balanced High Sharpe Portfolio Unlevered

Asset Class Capital	Allocation Percentage
Inflation-indexed bonds - short duration	38%
Nominal bonds - long duration	22
Alternative beta - (carry, value, momentum, trend etc.)	19
Global equities	11
Commodities	10
Total	100.0%

Expected return 4.2%

Expected risk 6.2%

- The beta balanced portfolio is then levered. (next page)
 - “The MOSERS approach (as a result of introducing a limited amount of leverage across the high Sharpe portfolio) is expected to maximize diversification while still achieving our assumed rate of return. The trade-offs that come with a more economically balanced or risk-balanced approach is dealing with various operational complexities associated with leverage and the simple, yet powerful, risk of being different.” - CAFR 2015

(Continued)

Missouri State Employee's Retirement System (“MOSERS”)

Beta-Balanced High Sharpe Portfolio Levered

Asset Class	Notional Allocation Percentage*
Inflation-indexed bonds - short duration	80%
Nominal bonds - long duration	46
Alternative beta - (carry, value, momentum, trend etc.)	39
Global equities	24
Commodities	21
Total	210%

Expected return (net of financing cost) 8.0%

Expected risk 13.0%

* The notional percentage adds up to 210%, which is the result from including the 1.1 times capital referred to above.

Beta-Balanced Levered + Illiquids

Asset Class Capital	Allocation Percentage
Inflation-indexed bonds - short duration	64%
Nominal bonds - long duration	37
Alternative beta - (carry, value, momentum, trend etc.)	31
Global equities	19
Commodities	17
Illiquids	20
Total	188%

Expected return 8.15%

Expected risk 12.7%

State of Wisconsin Investment Board (“SWIB”)

- Do not attempt to predict short-term market movements, but undertake an effort to understand the long-term impacts of poor, normal, and above average market results. In the “off year” of the two-year cycle, structural asset allocation adjustments and other funding initiatives are considered.

Asset Class	Target Allocation
U.S. Equities	23%
International Equities	21%
Fixed Income	36%
TIPS	20%
Real Estate	7%
Private Equity/Debt	7%
Multi-Asset	6%
Total	120%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
100	7.2	-2.9

Paradigm: Risk balanced; return seeking

- Plan is well-funded
- See their “risk” as the risk of not earning their actuarial return target
 - “Job 1 is earning the highest return possible”
- Manage assets classes holistically – one big fund of funds
- Use leverage on the lowest volatility – lowest expected return assets.
 - Goal is to use that leverage to offset the volatility of the equity assets – (like a risk parity strategy)
 - up to 20% leverage allowed
 - To employ the strategy - sold equity and then levered Fixed Income
 - Did not add leverage in isolation – it was added while reducing equity (risk) allocation.

Utah Retirement Systems

- The objectives of the current asset allocation are to protect investment capital in negative equity markets, reduce volatility, and increase investment diversification.
 - The Utah system has employed this philosophy for several years
- Alternative Investments = 40% of total portfolio assets

Asset Class	Target Allocation
Equity Securities	40%
Debt Securities	20%
Real Assets	13%
Private Equity	9%
Absolute Return	18%
Cash	0%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
84	7.5	-1.3

Paradigm: Risk focused;
protection in down markets

Oregon Public Employees Retirement System (“OPERS”)

- Large allocation to Private Equity and Real Estate
 - Early entrant
 - Long-history of successful investment results
 - Well-resourced staffing effort in illiquid assets

Asset Class	Target Allocation	Target Range
Public Equity	39%	31% to 47%
Core Fixed Income	10%	7% to 13%
Other Fixed Income	11%	2% to 8%
Private Equity	10%	5% to 15%
Real Estate	10%	5% to 15%
Hedge Funds	8%	4% to 12%
Opportunistic	2%	0% to 4%
Commodities	1%	0% to 2%
Risk Parity	5%	2% to 8%
GTAA	2%	0% to 4%
Operating Cash	0%	0% to 3%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
104	7.5	-4.5

Paradigm: Return seeking;
capture illiquidity premium

Washington State Investment Board

- Large allocation to illiquid assets (>40%)

Asset Class	Target Allocation	Target Range
Fixed Income	20%	16% - 24%
Tangible Assets	5%	3% - 7%
Real Estate	15%	12% - 18%
Global Equity	37%	32% - 42%
Private Equity	23%	19% - 27%
Innovation Portfolio	0%	0% - 5%
Cash	0%	0% - 3%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
90	7.8	0.7

Paradigm: Return seeking;
capture Illiquidity premium

South Carolina Retirement System

- Markets are efficient over the long-term, but can experience periods of dislocation. These dislocations create opportunities for investors to earn higher risk-adjusted returns for taking equity, credit, rate, inflation, illiquidity, and other risks.
- The Commission may also implement shorter-term investment strategies to mitigate the impact of expected market dislocations or to exploit market opportunities

Asset Class	Target Allocation
Global Public Equities	31%
Core Fixed Income	7%
Global Fixed Income	3%
Private Equity	9%
Commodities	3%
Real Estate	5%
GTAA/Risk Parity	10%
Hedge Funds (Low Beta)	8%
Mixed Credit	6%
Emerging Markets Debt	6%
Private Debt	7%
Short-Duration	3%
Cash	2%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
70	7.5	-3.8

Paradigm: Return seeking;
dynamic risk management

- Asymmetric Rebalancing bands for equity – wider on the bottom
 - 43% equity target min 30% and max 48%
 - Large credit exposure 17%
 - GTAA / and risk parity 10%
 - HFs 10%
- Relatively small allocation to private assets
 - Real Estate 5% / Private Equity 9%
 - Dynamic risk management
- Employ overlay portfolio to allow staff to alter asset allocation tactically

CalSTRS

- Recent asset liability study focused on shortfall risk – in near-to-mid-term
- Extensive examination of risk priorities and sensitivities
- Included new functional class (Risk Mitigation Class) 9% allocation
 - Functional class designed specifically to offset large negative equity market returns.
- Public equity portfolio is U.S.-centric

Asset Class	Target Allocation	Target Range
Global Equity	47%	41% - 53%
Private Equity	13%	10% - 16%
Real Estate	13%	10% - 16%
Inflation Sensitive	4%	1% - 7%
Fixed Income	12%	9% - 15%
Cash	2%	-1% - 5%
Risk Mitigation Class	9%	6% - 12%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
69	7.5	-3.3

Paradigm: Return seeking;
emphasis on illiquidity premium

Note: PCA Client

State of Hawaii ERS

- The Board of Trustees of ERS seeks preservation of capital with a consistent, positive return for the Plan.
- Broad growth portfolio components: Growth-oriented, Stabilized Growth, and Private Growth
- Board recently approved Crisis Risk Offset portfolio allocation – class designed specifically to diversify growth risk in a crisis. (20% allocation)
- Public equity portfolio is globally diversified

Asset Class	Target Allocation
Broad Growth	63%
Principal Protection	7%
Real Return	10%
Real Estate	0%
Crisis Risk Offset	20%
Opportunities	0%
Total Portfolio	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
61	7.6	-2.0

Paradigm: return seeking; risk focused

Note: PCA Client

Public School and Education Employee Retirement Systems of Missouri

- Strive to provide consistent performance by building a portfolio that offers significant protection during market weakness but also can participate in periods of market strength.

Asset Class	Target Allocation	Target Range
U.S. Public Equities	27%	16% - 48%
Non-U.S. Public Equities	15%	8% - 28%
Public Credit	12%	0% - 20%
Hedged Assets	6%	0% - 25%
U.S. Treasuries	16%	0% - 40%
U.S. TIPS	4%	0% - 40%
Cash Equivalents	0%	0% - 10%
Private Equity	11%	4% - 14%
Private Real Estate	8%	4% - 10%
Private Credit	7%	0% - 7%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
83	8.0	-2.7

Paradigm: Risk managed, return seeking

- Portfolio Structure
 - Public risk 60% - includes Hedge Funds as equity substitute
 - Safe assets 20%
 - Private risk 20%
- Dynamic risk management
 - Very wide policy weight bands
- Dynamic asset class structure (U.S. Equity and Emerging Equity allocation > Europe Equity)

Mass PRIM

Asset Class	Target Allocation
Global Equity	42%
Core Fixed Income	13%
Value-added Fixed Income	10%
Private Equity	10%
Real Estate	10%
Timberland	4%
Hedge Funds (Net of Fees)	10%
Portfolio Completion Strategies	1%
Overlay	0%
Total	100%

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
70	7.5	0.0

Paradigm: Traditional long-term investor philosophy – with additional diversifying strategies

- \$60.4 Billion in Assets

Idaho PERS

Investment Philosophy: Keep it simple

- Lay board
- Limited resources
- Limited time for complexity

Rebalancing in volatile market - mechanical

- Investment horizon is effectively 5-7 years (long, but not too long)
- Can still be a patient investor
- “Don’t fight volatility”
- “Don’t pay up to manage it”
- “Spending precious time on “managing” active managers is a time consuming activity – with outcomes that do not materially impact the fund’s financial condition”
- Equity portfolio tilted to U.S. equity

Asset Class	Target Allocation	Target Range
Broad Domestic Equity	55%	50% - 65%
International Equity	15%	10% - 20%
Fixed Income	30%	23% - 33%
Cash	0%	0% - 5%
Total	100%	

Funding Ratio (%)	Return Target (%)	Net Cash Flow (% of Assets)
94	7.0	-1.6

Paradigm: traditional long-term investor

Multi-Asset Products

Multi-product Approach: Research Affiliates

- Robert Arnott, CIO
- 5% real return target
- Investment Philosophy / Strategy based on:
 - Active management
 - Contrarian investment management style
 - Tail risk hedging (to a certain extent)
 - Use whole investment tool box (liquid assets), including shorting

Legs of the portfolio stool:

- Stocks (diversified)
- Bonds (diversified)
- Inflation-related assets

All-Weather Portfolio: Bridgewater

- Bonds will perform best during times of disinflationary recession, stocks will perform best during periods of economic growth, and cash will be the most attractive when money is tight.
 - All asset classes have environmental biases.
- Low-risk/low-return assets can be converted into high-risk/high-return assets – by employing leverage.
 - When viewed in terms of return per unit of risk, all assets are more or less the same
- The process puts equal risk on each scenario to achieve balance. Investors are always discounting future conditions and they have equal odds of being right about any one scenario.
- The strategy holds four different portfolios each with the same risk (expected volatility), each of which does well in a particular environment: when (1) inflation rises, (2) inflation falls, (3) growth rises, and (4) growth falls relative to expectations
- The all-weather approach can be managed to specific total portfolio volatility targets

		Growth	Inflation
MARKET EXPECTATIONS	Rising	25% OF RISK Equities Commodities Corporate Credit EM Credit	25% OF RISK IL Bonds Commodities EM Credit
	Falling	25% OF RISK Nominal Bonds IL Bonds	25% OF RISK Equities Nominal Bonds

Source: Bridgewater Associates

Academia

Andrew Lo Approach: Based on Concept that Risk is Dynamic

- Any view of the world and how it works can be right – in the long run. But, it can be out of favor in the short-to-medium term and can be very wrong.
 - Being wrong can cause pain for those who fall on the wrong side of the market.
- A static asset allocation policy
 - Assumes asset class return relationships stay constant across all periods
 - And relationships conform with historical experience in the long-term
 - Assumes returns mean revert and that the investor can stand the pain until they do
- Can a plan that is not well-funded and has a large net negative cash flow wait until returns mean revert?
- Therefore, investors should adapt to market risk conditions
- This philosophy makes sense if you believe that the financial markets are more integrated than in the past and that the madness of mobs is more prevalent today – and will continue in the future. (continued)

Andrew Lo Approach: Based on Concept that Risk is Dynamic

- Investment strategy
 - Diversify across more asset classes and strategies
 - Employ Long / short strategies
 - Alphas are really multiple betas
 - U.S. equity beta / Currency beta / Liquidity beta /Commodity beta
 - Utilize passive indices based on algorithms
 - Manage risk vis active volatility scaling algorithms
 - “In the long run we’re all dead, but make sure the short-run doesn’t kill you first”
 - Asset allocation is about managing change. Betas and return premia vary through time.
 - If the investor cannot effectively manage change – then a static asset allocation is appropriate.

Andrew W. Lo is the Charles E. and Susan T. Harris Professor, a Professor of Finance, and the Director of the Laboratory for Financial Engineering at the MIT Sloan School of Management.

Public Fund Investment Paradigms Review

Take Aways:

- No paradigm works best in every market environment
 - There will be periods of underperformance – you will be second guessed at some point
- You have to be able to implement your philosophy – poor implementation could sink it
 - The investor's ambitions must match their resources
- Changing paradigms (or changing to a new paradigm) can be risky in the near-to-mid term
 - Danger of being whipsawed

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