PCA | PENSION CONSULTING ALLIANCE

Rhode Island SIC

Inflation Protection Class
Policy & Structure Discussion

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Today's Discussion

Inflation Protection Class Portfolio:

- Background

- Objectives

- Proposed Policy

Inflation Protection Class Portfolio:

- <u>ERSRI, like all long-term investors is vulnerable to spikes in inflation that reduce the investor's purchasing power as nominal asset returns are eroded by inflation</u>

- 2016 asset / liability review: allocation to inflation protection class 10%
  - Recently reduced to 8% policy weight (bank loans / short-duration high yield moved to Income Class)

- There are two primary forms of inflation
  1. Unanticipated / sharp rise
  2. Anticipated / measured rise

- Individual assets behave differently in different inflationary regimes
  - TIPS / natural resources / energy resources in <u>general</u> fare well in unanticipated inflation regimes
  - Core Real Estate / Infrastructure (assets that have periodic resets of rents / contractual income – tied to inflation) in <u>general</u> fare well in anticipated inflationary regimes

Inflation Protection Class Portfolio: Basic Construct

a _functional class_ designed to perform well in inflationary market environments

Investment Objectives:

- Long-term real return (CPI + ~3%)

Investment Characteristics:

- Growth diversification

- Volatility lower than public equity / higher than Core fixed income

Risks:

- Real Interest Rate Risk

- Active Management Risk

- Economic Growth Risk

- Liquidity Risk

- Underwriting a functional class to provide inflation protection is challenging

  - There is no perfect hedge for inflation

  - Assets that have sensitivity to inflation also have sensitivities to other factors that can overwhelm the inflation impact in the near to mid term

Inflation Protection Portfolio: Investable Universe

Investable Universe

1. Liquid Fixed Income
   - Inflation-linked bonds (TIPS or GILBs)

2. Liquid Natural Resources
   - Commodities (oil futures, agriculture futures)

3. Private Assets
   - Core Real Estate (focus on income / low leverage)
   - Infrastructure
   - Agriculture / Farmland
   - Timber

Inflation Protection Portfolio: Policy

ERSRI Policy Customization

- Decrease inflation protection class allocation to 8% (≈ $640mn) (formerly 10%)
  - o Rationale: increased Income Class (bank loans / short-duration HY moved to Income Class)

- Structural allocation policy: include relatively wide allocation bands for management flexibility
  - o Provide flexibility to deviate from policy weights as market conditions evolve
    - o Consider timber / agriculture if market conditions warrant
  - o Allocation to private assets requires some policy weight flexibility

- Maximum: 80% private assets

- Performance for the inflation protection class evaluated on rolling 5 year periods
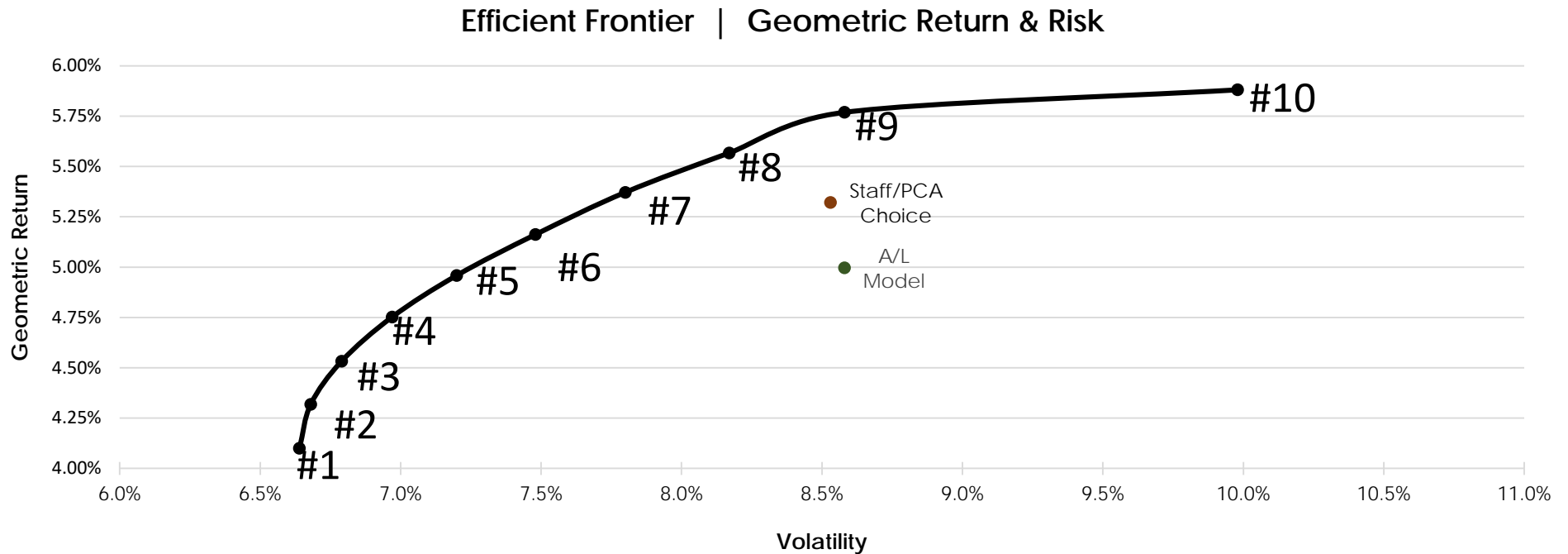
Inflation Protection Portfolio: Modeling Process

<u>Strategic Allocation Modeling Process / Policy Development</u>

1. Identify investable universe
   - Examine current fundamentals and historical traits/behavior

2. Develop assumptions (volatility / total return / correlations)

3. Run optimization (with minimal constraints)
   a) Mean-variance optimization essentially optimized each portfolio on a risk/return basis and kept the portfolio CPI beta at the 0.50 floor

4. Narrow investable universe

6. Select potential policy allocations and test for reasonableness
   - Test for fidelity to asset / liability modeling assumptions and objectives

NOTE: Modeling input / constraints in appendix

Inflation Protection Portfolio: Modeling Output

Efficient Frontier | Geometric Return & Risk

	Portfolio #1	Portfolio #2	Portfolio #3	Portfolio #4	Portfolio #5	Portfolio #6	Portfolio #7	Portfolio #8	Portfolio #9	Portfolio #10	A/L Model	Staff/PCA Choice
Geo. Return	4.1%	4.3%	4.5%	4.8%	5.0%	5.2%	5.4%	5.6%	5.8%	5.9%	5.0%	5.3%
Volatility	6.6%	6.7%	6.8%	7.0%	7.2%	7.5%	7.8%	8.2%	8.6%	10.0%	8.6%	8.5%
Sharpe Ratio	0.31	0.34	0.37	0.39	0.41	0.42	0.43	0.44	0.45	0.41	0.36	0.40
CPI Beta	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.43	0.61

CPI beta: "CPI Surprise Betas" are betas to unexpected inflation (Full description in appendix)

Inflation Protection Portfolio: Allocation Selection

- Infrastructure + includes infrastructure / timber / agriculture
- TIPS / Natural Resources are liquid investment s

	Portfolio #1	Portfolio #2	Portfolio #3	Portfolio #4	Portfolio #5	Portfolio #6	Portfolio #7	Portfolio #8	Portfolio #9	Portfolio #10	A/L Model	Staff/PCA Choice
Geo. Return	4.1%	4.3%	4.5%	4.8%	5.0%	5.2%	5.4%	5.6%	5.8%	5.9%	5.0%	5.3%
Volatility	6.6%	6.7%	6.8%	7.0%	7.2%	7.5%	7.8%	8.2%	8.6%	10.0%	8.6%	8.5%
Sharpe Ratio	0.31	0.34	0.37	0.39	0.41	0.42	0.43	0.44	0.45	0.41	0.36	0.40
CPI Beta	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.43	0.61

	Portfolio #1	Portfolio #2	Portfolio #3	Portfolio #4	Portfolio #5	Portfolio #6	Portfolio #7	Portfolio #8	Portfolio #9	Portfolio #10	A/L Model	Staff /PCA Choice
TIPs	54%	47%	40%	34%	27%	20%	13%	6%	0%	0%	30%	13%
Natural Resources	11%	11%	11%	11%	12%	12%	12%	12%	11%	0%	0%	12%
Core RE	18%	21%	23%	25%	27%	28%	30%	32%	38%	67%	47%	45%
Infrastructure+	16%	21%	25%	30%	35%	40%	45%	50%	52%	33%	23%	30%

Inflation Protection Portfolio: Allocation Selection & Policy

- PCA and Staff recommend policy below

- Rounded/naïve allocations are incorporated to reflect humility

- This structure is logical, implementable, and balances the risk/return tradeoff

- Illiquid inflation protection asset move to long-term policy weight at a measured pace

Policy Guidelines

Inflation Protection Class Components	Long-term Target	Long-term Policy Ranges
TIPs	13%	0-25%
Natural Resources	12%	0-25%
Core Real Estate	45%	30-60%
Infrastructure +	30%	15-45%
	100%	---

Policy guidelines allow management flexibility as market conditions evolve

Inflation Protection Portfolio: Benchmarks & Diversification

Policy Benchmark:

- Blend of individual asset class indices

Individual assets' benchmarks:

- Core Real Estate   NFI-ODCE Index
- Infrastructure   CPI +4%
- TIPS   Bloomberg Barclays 1-10 Year TIPs Index
- Natural Resources   Bloomberg Commodity Index (Total Return)

Diversification

- The inflation protection class is expected to provide diversification of equity (growth risk).
- The portfolio will be diversified across numerous sources of real return

Appendix

Inflation Protection Class Portfolio: Modeling Inputs

Return/Risk Assumptions

Strategy	Arithmetic Return	Geometric Return	Volatility	CPI Beta
TIPs	3.00%	2.80%	7.00%	0.25
Natural Resources	4.25%	2.25%	22.00%	2.00
Core Real Estate	6.30%	5.55%	13.33%	0.75
Infrastructure	6.30%	5.55%	13.33%	0.00
Timber	6.30%	5.55%	13.33%	0.00
Agriculture	6.30%	5.55%	13.33%	0.00

Correlation Matrix

	TIPs	Commodities	Core	Infrastructure	Timber	Agriculture
TIPs	1.00					
Commodities	0.30	1.00				
Core	0.15	0.30	1.00			
Infrastructure	0.25	0.15	0.35	1.00		
Timber	0.10	0.00	0.05	0.15	1.00	
Agriculture	0.05	0.00	0.15	0.15	0.35	1.00

Inflation Protection Class Portfolio: Terminology

- Arithmetic (average) Return

  o The return expected in any <u>single</u> given year

- Geometric/Compound (average) Return

  o The average/annualized return expected over a multi-year (e.g., 10) horizon

  o Geometric return = compound return

  o Due to volatility impacts, the geometric/compound average return is always less than the arithmetic average return

- Volatility/Standard Deviation

  o A measure that broadly describes how wide/narrow a distribution of returns is

  o Roughly 2/3 of all outcomes/observations fall within +/- one SD

- Annual Yield

  o The annual cash distribution

  o May be distributed monthly, quarterly, bi-annually, or annually

- CPI Beta

  o "CPI Surprise Betas" - betas to unexpected inflation. If the market expects inflation of 3% in a given quarter (annualized) and we actually get 4%, then you can multiply the 1% "surprise" by each beta figure and that will give you the extra return that asset would produce compared to if there weren't an inflation surprise. This is a partial beta coefficient; there are multiple factors that are driving these classes' returns but they do have a partial sensitivity to surprise inflation.

Inflation Protection Class: Asset / Liability Review Inputs

The Inflation Protection Portfolio is a functional / purpose-driven strategic class
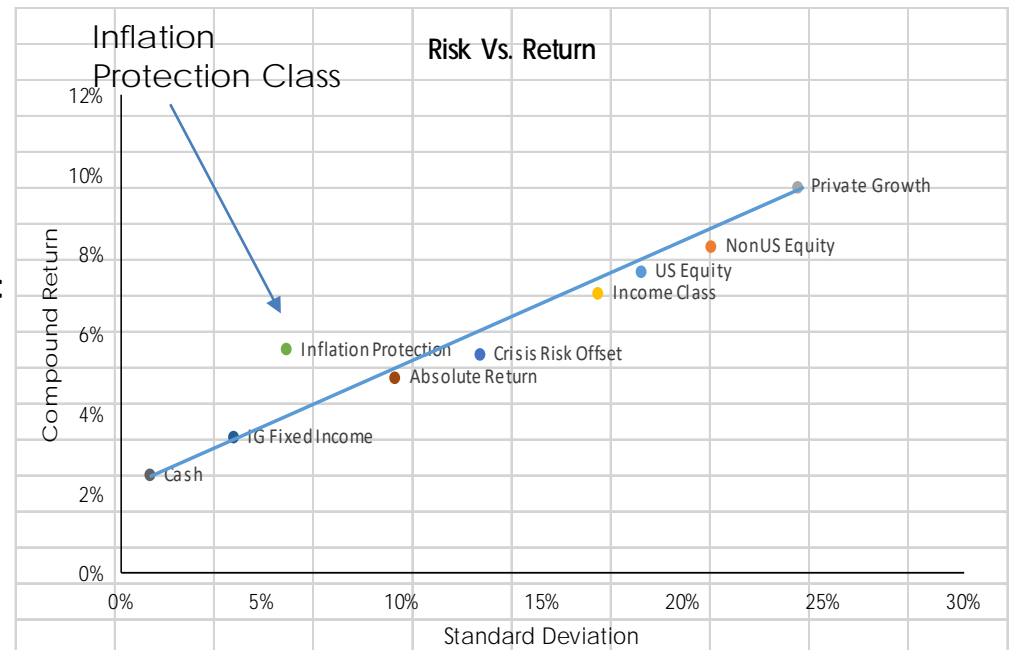
- Designed to perform well in inflationary market regimes composed of public and private assets / fixed income and equity securities

Asset / Liability Modeling Assumptions:

	Expected Return (geo)	Volatility
Inflation Class	5.6%	5.9%

Inflation Protection Class Modeling Components:

Composition:		Expected Return	Volatility
Bank Loans	21%	5.79%	15.60%
Core Real Estate	37%	5.49%	12.00%
Core Infrastructure	18%	6.39%	9.25%
TIPS	24%	3.49%	6.00%

Risk Vs. Return — Inflation Protection Class. Chart of Compound Return vs. Standard Deviation showing: Cash, IG Fixed Income, Inflation Protection, Absolute Return, Crisis Risk Offset, Income Class, US Equity, NonUS Equity, Private Growth.

Modeling and portfolio structure / underwriting may differ as market conditions evolve

Note: September 28, 2016 SIC Materials

Proposed Portfolio Rebalancing Policy: Asset / Liability Review

Strategic Class	Focus Portfolio %	Rebalancing Bands
Global Equity	40	+/- 2%
Private Growth *	15	+/- 4%
Income Class	6	+/- 2%
Crisis Risk Offset	8	+/- 2%
Inflation Protection *	10	+/- 3%
IG Fixed Income	11.5	+/- 2%
Absolute Return	6.5	+/- 2%
Cash	3	+/- 2%
Total	100%	100%

Note: Current rebalancing policy is +/- 2% for all classes

- Wider rebalancing bands for functional classes with illiquid assets --- minimizes denominator effect in market crisis
- Will promote smoother investing of additional allocations to illiquid assets and promote vintage year diversification
- Current policy is to rebalance monthly

* Functional Class includes illiquid assets

Note: September 28, 2016 SIC Materials

Review: Portfolio Structure for Optimization Purposes

Strategic Classes	Classes/Assets for Optimization Purposes		Components of Optimization Classes/Assets
Growth Class	Global Equity	=	100% Global Equity
		=	
	Private Growth	=	75% Private Equity
			15% Non-Core Real Estate
			10% Opportunistic Private Credit
Income Class	Income Class	=	25% REITs
			25% High Yield Infrastructure
			25% High Yield
			25% Private Credit
Risk Reduction Class	Crisis Protection	=	50% Treasury Duration
			50% Systematic Trend Following
	Inflation Protection	=	21% Bank Loans
			37% Core Real Estate
			18% Core Infrastructure
			24% TIPS
	IG Fixed Income	=	100% IG Fixed Income
	Absolute Return	=	100% Absolute Return
	Cash	=	100% Cash

Nine Asset / Functional Classes to be Optimized

Note: September 28, 2016 SIC Materials