Rhode Island State Investment Commission

Asset Allocation Study – Optimizations

Pension Consulting Alliance, Inc.

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Overview

The overall fund goal:

- An investment portfolio in a defined benefit plan exists to *provide assets that meet benefits agreed upon both now and in the future*

The goal of asset allocation:

- Building a portfolio to achieve the highest return with lowest risk and the highest probability of achieving the fund's overall goal

Target Return

Review of Current Policy vs. Peers

Asset Class	RI Target %	Public Funds
Domestic Equities	42.5	38.0
International Equities	20.0	16.0
Total Public Equity	*62.5*	*54.0*
Real Estate	5.0	4
Alternative Investments	7.5	9
Total Private	*12.5*	*16.0*
Total Equity Oriented Inv.	**75.0**	**70.0**
Domestic Bonds	25.0	30.0
Cash/short-term	0.0	
Total Stable Investments	**25.0**	**30.0**
Total	**100.0**	**100.0**

Public Fund Data - Greenwich Associates

guess

Traditional Real Estate
Value added mezz/mez
Private Eq.

Measuring Risk

View / Manage

Risk Measures Used in Asset Allocation:

Asset Alloc.

- Total investment return volatility (annualized standard deviation)
- Probability of not achieving a target rate of return (downside variance measures) Move from today
- Volatility of funding ratios
- Volatility of surplus
- Potential for higher-than-expected employer contributions

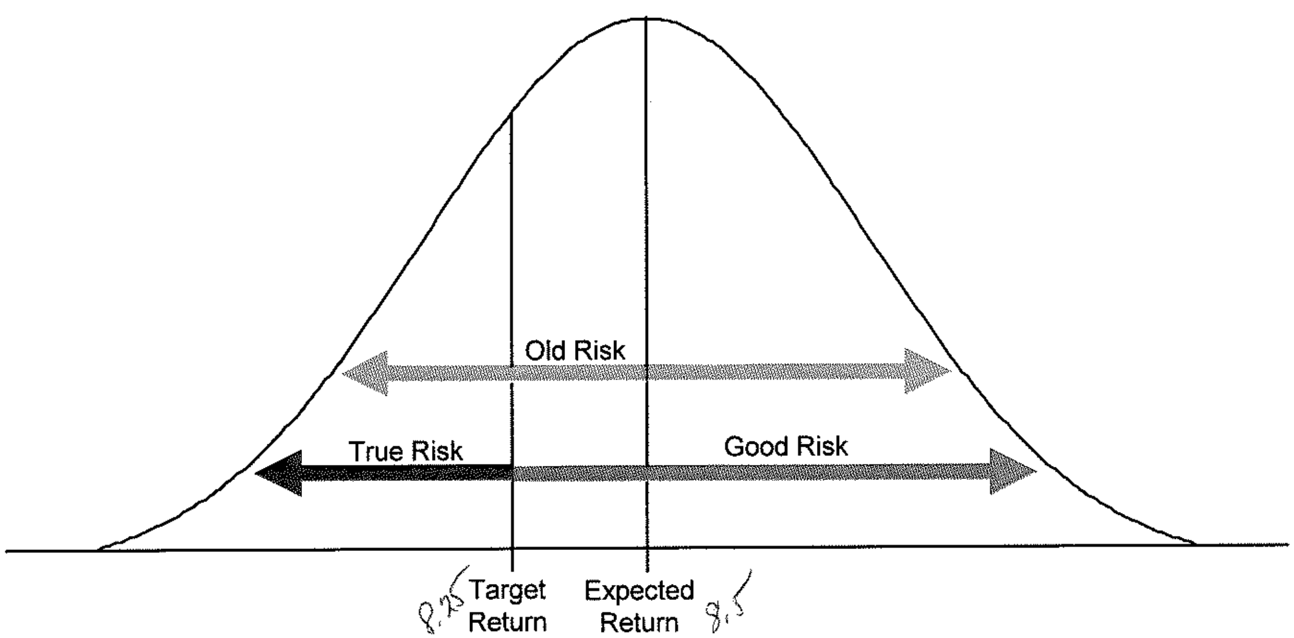
define

Risk - Downside Deviation

- Defines risk as failure to meet a minimum return target
- Uses target semi-variance to measure risk
- In the context of the optimization, efficient portfolios are identified as having the least downside risk at a specified goal (8.25%) for varying levels of expected return

Measuring Risk

The Normal Distribution of Returns



subtle change
True Risk

- Old Risk (annualized standard deviation) focuses on risk around the expected return
- True Risk (downside variance) focuses on risk of not achieving a *specified objective*
- Part of total volatility is actually Good Risk

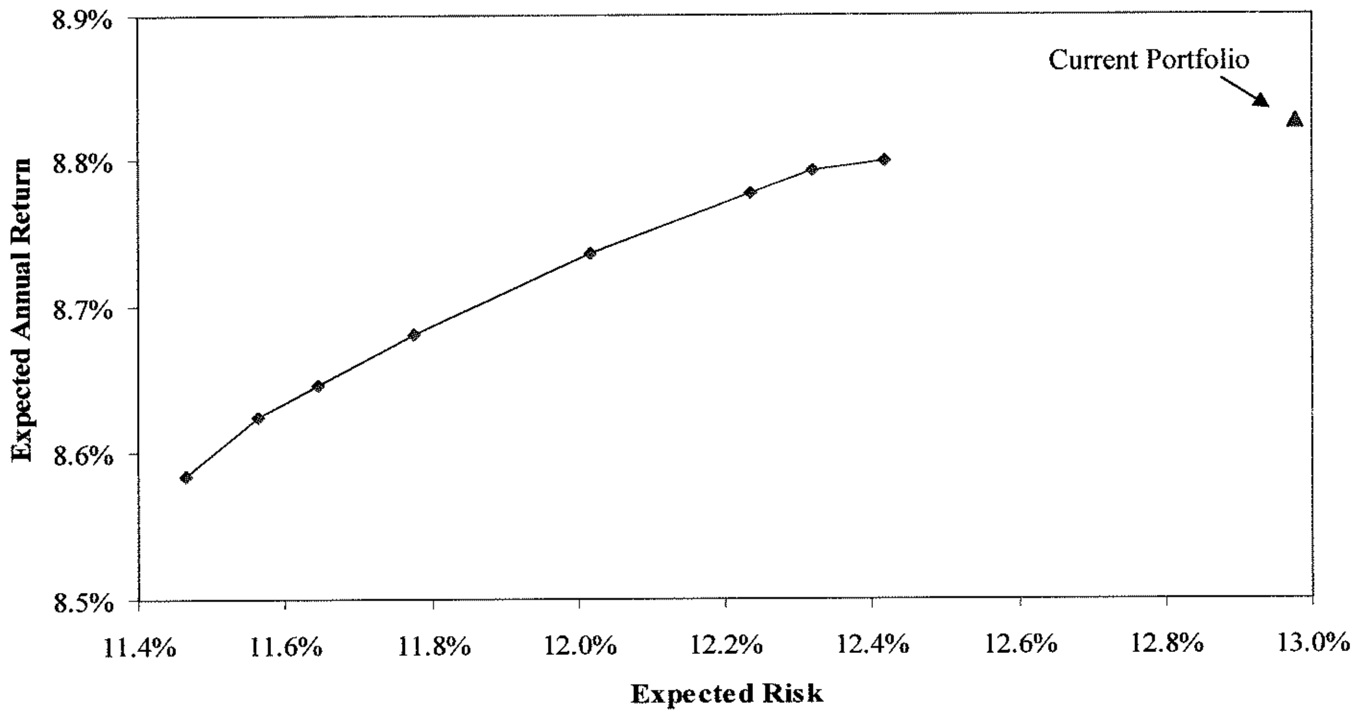
Asset Class Constraints:

Constrain the model
model outputs

Tune
model
constraints

	Original	Proposed
U.S Equity	35 – 50%	
Non-U.S. Equity	15 – 25%	
Real Estate	5 – 10%	
Private Equity	5 – 10%	7.5 – 10%
Fixed Income	25 – 40%	20 – 40%
Real Return	0 – 10%	7.5 – 15%
Opportunistic	0 – 10%	0 – 5%
Liquidity		2% fixed

Optimizations: Creating Efficient Portfolios

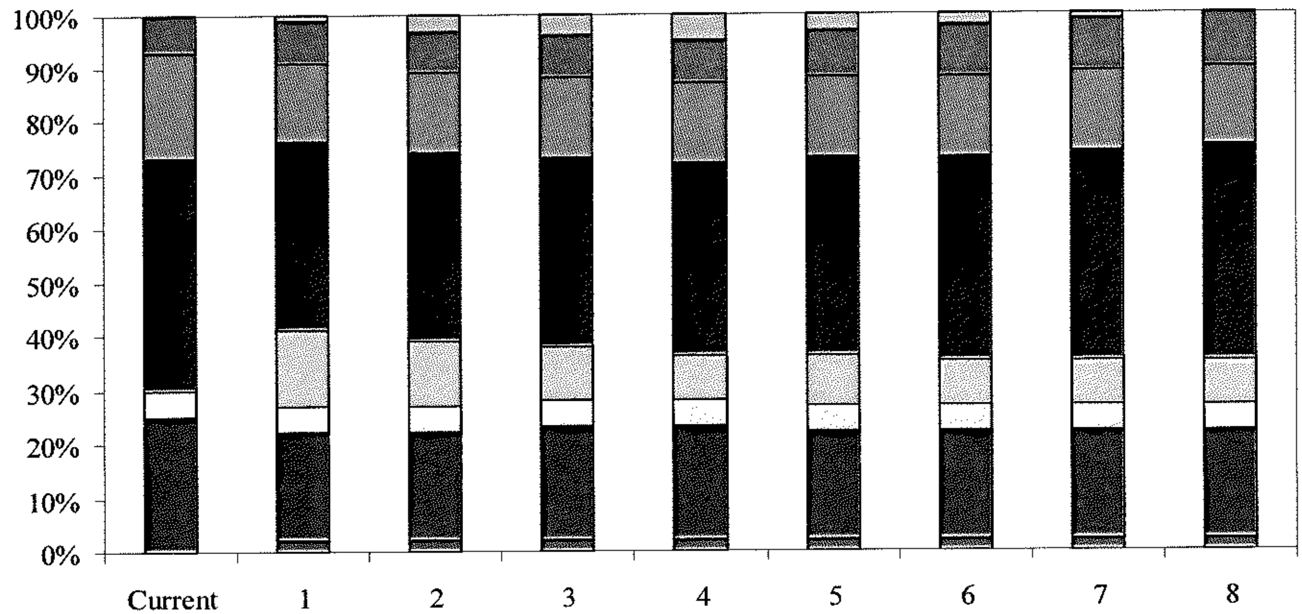


focus downside deviation

Portfolio	Current	1	2	3	4	5	6	7	8
Exp. Return	8.83%	8.58%	8.62%	8.64%	8.68%	8.73%	8.78%	8.79%	8.80%
1 Yr SD	12.98%	11.47%	11.57%	11.65%	11.78%	12.02%	12.23%	12.32%	12.42%

Standard Deviation

Optimizations: Creating Efficient Portfolios



Portfolio	Current	1	2	3	4	5	6	7	8
Cash	0%	2%	2%	2%	2%	2%	2%	2%	2%
U.S. Fixed	25%	20%	20%	21%	21%	20%	20%	20%	20%
Real Estate	5%	5%	5%	5%	5%	5%	5%	5%	5%
Real Return	0%	14%	12%	10%	8%	9%	8%	8%	8%
U.S. Equity	43%	35%	35%	35%	36%	37%	38%	39%	40%
Non-U.S. Equity	20%	15%	15%	15%	15%	15%	15%	15%	15%
Private Equity	7%	8%	8%	8%	8%	9%	10%	10%	10%
Opp Oriented	0%	1%	3%	4%	5%	3%	2%	1%	0%

– emerging mkt exposure

Initial Findings

- Proposed efficient portfolios offer better risk / return trade-off than the existing policy portfolio
- Adding diversifying assets improves expected return and risk profile
- Due to the characteristics of the input assumptions most of the variability of the choices revolve around the Real Return, Private Equity and Opportunistic Portfolios weightings

Issues for Future Discussion:

- Consider adding bands / ranges around asset class policy allocations to increase management flexibility
- Rebalancing policy
- Risk management product

need rigorous risk mgmt.

correct:

Appendix

all assumptive in creating model out put

Expected Inflation, Average Annual Risk Free Rates & Annual Risk Premiums for Various Class - %

Category	Expectation – Annual %	Comments
Inflation	3.00	Lower near-term inflation due to higher unemployment, lower capacity utilization for foreseeable future. Extrapolated trend for inflation is downward. TIPS breakevens do not represent equilibrium forecast due to poorer liquidity considerations vs. nominal yields. Post-recession, reasonable potential for resurgence of inflation.
Real Risk-Free Rates		
Short-term (Cash)	1.00	Federal Reserve short-term lending rates currently between 0.0% and 0.5%, currently lower than long-term inflation expectations and below recent realized inflation. Thus, the Fed current short-term rates establish real lending rates at close to 0% or even negative. Expectation is for very low real short-term lending rates over the next year or two, to rise steadily as economic growth improves. Extrapolated trend shows real risk free trend barely above 0%, its current level.
Longer-term (10-year TIPS yield)	2.25	Long-term real yield is current 10-year TIPS yield adjusted to nearest quarter point and reflects general consensus view of long-term real economic growth. As of 1/2/09, current 10-Year TIPS yield was 2.20%. 10-Year TIPS currently valued favorably versus nominals due to liquidity considerations.
Risk Premiums over Short-term Real Risk-free Rate:		
Domestic Core Fixed Income International Fixed Income Global Fixed Income	1.25	Yield-to-maturity on Barclays Capital Universal as of 1/2/09 was 4.99%. 2008 marked the continued widening of credit spreads as well as maintenance of relatively steep yield curve, both positives for expected bond returns. Current expected return represents modest increment over yield to account for impact of wider credit spreads in near term. Longer-term (post recession), higher expected inflation expected to prove detrimental to fixed income returns. Reflects extrapolation of recent trends.
Core Real Estate	2.75	Assumes a mix of private core real estate and a variable allocation of between 5% and 20% of public real estate securities. Reduction from 2008 reflects high likelihood of capital writedowns as well as extrapolated reversal of trend off peak historical results.
Basic Real Return	3.25	Combination of TIPS, Timber, Commodities, and Hedge Funds of Funds. May include other segments. Generally upward outlooks for TIPS and Commodities. Timber and Hedge Funds of Funds face marked-to-market challenges in near-term. Positive reversal of extrapolated trend expected.
Domestic Equity International Equity Global Equity	6.00	Equity premium likely has reached trough in its long-term cycle, trend expected to adjust upwards over next several years. Fundamental expectations favorable versus strict trend extrapolations. As of early December 2008 dividend yields exceeded commensurate Treasury yields for the first time in 50 years. Reasonable dividend growth also expected over next cycle, but could diminish. Valuations also reasonable. Downside risk is extended recession. For long-term planning purposes U.S. and Non-U.S. equity risk premiums assumed to be equal.
Hedged International Equity	5.90	Equity premium less frictional cost of hedging.
Alternative Investments/Private Equity	8.50	Expected long-term illiquidity premium over public equity of 3.0%. Higher leverage should enhance long-term return, but increases downside risk. Current expectation adjusted downward to reflect extrapolated trends. Premium over public equity likely will decline in near-to-intermediate term due to lag of marked-to-market effects.

2009 Ten-Year Return, Risk, and Correlation Assumptions

Last revision: 1/09

Summary of Asset Class Assumptions

geometric

	Expected Avg. Nominal Annual Return	Exptd. Geo. Cmpnd. Nominal Annual Return	Exptd. Risk of Nominal Returns (Ann SD)	Cash	TIPS	CoreFxd	IntlBds	GlblBds	RealEst	RealRet	USEq	IntlEq	GlblEq	HIntlEq	PrivEq	Opp Orientd
Cash	4.00	4.00	2.0													
Treas. Infl. Protected Securities	5.25	5.10	6.0	0.20												
Domestic Core Fixed Income	5.25	5.15	4.5	0.40	0.60											
International Fixed Income	5.25	4.75	10.0	-0.15	0.40	0.45										
Global Fixed Income	5.25	4.90	8.0	-0.05	0.50	0.50	0.95									
Core Real Estate	6.75	6.25	10.0	0.25	0.00	0.00	-0.25	-0.25								
Real Return	7.25	6.75	10.0	0.25	0.60	0.25	0.00	0.00	0.40							
Domestic Equity	10.00	8.50	17.5	0.10	0.00	0.30	0.00	0.00	0.40	0.25						
International Equity	10.00	8.00	20.0	0.00	0.00	0.10	0.10	0.00	0.40	0.25	0.80					
Global Equity	10.00	8.50	17.5	0.10	0.00	0.10	0.05	0.00	0.40	0.25	0.90	0.90				
Hedged International Equity	9.90	8.10	19.0	0.20	0.00	-0.10	-0.20	-0.20	0.50	0.40	0.90	0.90	0.90			
Priv Equity/Venture Capital	12.50	9.40	25.0	0.15	0.00	0.00	-0.05	-0.10	0.50	0.25	0.80	0.75	0.80	0.85		
Opportunity Oriented	9.50	8.90	11.2	0.25	0.25	0.60	0.25	0.25	0.50	0.35	0.80	0.60	0.70	0.75	0.50	
Inflation	3.00	3.00	1.5	0.50	0.50	0.00	-0.15	-0.20	0.40	0.60	0.20	0.20	0.20	0.40	0.00	0.10

Indices Used in Modeling Asset Class Assumptions

Asset Class	Index
Cash	Barclays Capital 90-day Treasury Bills
TIPS	Barclays Capital TIPS, simulated TIPS series per Bridgewater
Domestic Core Fixed	Barclays Capital Universal, Barclays Capital Aggregate Index, Barclays Capital G/C Index, Barclays Capital Intermediate Govt. Index, Barclays Capital Corp/Credit Index
International Fixed	Citigroup World Non-US Government Bond Index
Global Fixed	Barclays Capital Global Aggregate, Salomon/Citigroup World Government Bond Index
Core Real Estate	NCREIF Index, Prior Indices
Real Return	Barclays Capital TIPS, various Hedge Fund Indices, NCREIF Timber Index, S&P/GSCI Commodities Index
Domestic Equity	Russell 3000 Index, S&P 500 Index
International Equity	MSCI/Barra ACWI ex-US Index, MSCI/Barra EAFE Index
Global Equity	MSCI/Barra ACWI World Index
Hedged Intl. Equity	Hedged MSCI/BarraEAFE Index
Private Equity	Prior Brinson Venture Capital Index, VCJ Post Venture Capital Index

Notes:

PCA developed its average annual return premiums and standard deviation estimates using a combination of approaches. First, for major asset classes with an appropriate amount of history, PCA studied historical time series over both one-year and five-year holding periods to uncover any specific trends in the time series data. For example, domestic stock return premiums exhibited cyclical behavior, with each full cycle lasting approximately 40-50 years. Statistical procedures were used to identify such trends and extrapolate these trends 10-15 years forward. Second, PCA examined fundamental variables underlying several major asset classes and computed expectations based on consensus views of these variables. PCA also reviewed outlook opinions from a handful of leading investment banks and investment advisory firms. PCA compiled these opinions to develop consensus expectations for the major asset classes. PCA then used these consensus expectations as reference checks against its own expectations. Finally, PCA professionals discussed and debated asset expectations internally until a consensus view developed.

In recognizing that asset class risks are not always stable, PCA also examined risk trends utilizing similar statistical procedures. PCA also calculated risks weighting more recent periods heavier than earlier periods. In certain instances, weighted standard deviations differed materially from basic standard deviations. In these cases, PCA utilized weighted standard deviations as a base line for analysis.

In recognizing that correlations are also not always stable, PCA analyzed the current behavior of the correlations among major pairs of asset classes. In analyzing the correlation trends among pairs of assets, we focused on correlation trends across non-overlapping five-year holding periods. Using statistical procedures highlighted above, we extrapolated the trends of these correlations into the future to gain a sense of their level and direction. For correlation pairs containing short annual return histories, we analyzed correlations of annual returns. Similar to analyzing risks, we also applied a decay factor to return history and calculated weighted correlations where appropriate.

Given the complexities associated with developing capital market expectations, we advise users of the above information to rely on judgment as well as optimization approaches in setting strategic allocations to any set of investment classes. Please note that all information shown is based on qualitative and quantitative analyses. Exclusive reliance on the above is not advised. This information is not intended as a recommendation to invest in any particular asset class or as a promise of future performance. References to future returns for either asset allocation strategies or asset classes are not promises or even estimates of actual returns a client portfolio may achieve.

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