City and County of San Francisco
Retiree Health Care Trust Fund

Asset Allocation Policy Review

Presented
June 18, 2014

MEKETA INVESTMENT GROUP
5796 ARMADA DRIVE SUITE 110 CARLSBAD CA 92008
760 795 3450 fax 760 795 3445 www.meketagroup.com

Table of Contents

Introduction

- This document presents asset allocation options for the Retiree Health Care Trust Fund. We focused on showing a variety of policy options, which cover a range of return and risk expectations.
- We provide various approaches to assessing the risk in each policy option in order to provide a "mosaic" of the risks faced by the Fund.
- The goal of this review is not to declare one portfolio the "right" choice or the only prudent choice, but to highlight the risk and return tradeoffs of different policy portfolios.
- Over long periods of time, riskier assets, such as equities, are likely to produce relatively high rates of return. Consequently, higher allocations to risky assets increase the likelihood of the Fund achieving its long-term return expectations. However, riskier assets increase volatility in the short term.
- The asset allocation review process highlights the natural tension between long term goals and short term risks, and should allow the Fund to make more informed decisions regarding portfolio positioning.

Asset Allocation Review Process

Process for Developing an Asset Allocation Policy

- Define objectives and constraints
- Define/understand risk
- Review asset allocation policies under various types of risk analysis
- Set actuarial assumed rate of return and target allocation
- Implement new asset allocation policy

At today's meeting, we will focus on the first four components of the asset allocation process.

Objectives

- RHCTF Objectives:
  - To provide a funding source to defray the cost of the City's, and other participating employer's, obligations to pay health and welfare benefits for retirees.
  - To be fully funded, or for certain budgetary criteria to be met, before withdrawing assets from the Fund.
- Investment objectives to consider:
  - To use diversification to minimize company-specific, industry-specific, country-specific, and other idiosyncratic risks in the Fund.
  - To maintain a return in excess of medical inflation.
  - To earn a return over the actuarial assumed rate (An assumed rate has not been established by the Board. In the past, for valuation purposes, the actuary has used a discount rate of 7.5%, which was based on the actuarial assumed rate of return for the SFERS Pension.)
  - To provide a return based on levels of liquidity and risk that are prudent.
  - To maintain liquidity in order to meet disbursement needs during adverse market conditions.
  - To invest assets at a low cost.

Constraints

- Time Horizon:
  - The RHCTF will be managed on a going-concern basis. The assets of the RHCTF will be invested with a long-term time horizon (twenty years or more).
- Liquidity:
  - Except for certain budgetary criteria, no assets can be withdrawn until full funding occurs.
  - Net cash flows are expected to be positive and significant in the near future.
  - Due to the co-investment with SFERS, assets will be invested in vehicles that offer daily liquidity.
- Legal and Regulatory:
  - Assets are to be at all times invested in accordance with applicable laws.
- Other constraints to consider:
  - The size of the RHCTF may limit investable options to certain asset classes and account types.
  - Co-investing the RHCTF assets with SFERS currently limits the RHCTF investments to three asset classes: domestic equity, international equity, and investment grade bonds.
  - The level of dedicated staff to support the operations and investments of the RHCTF may limit the investment options for the Fund.

Defining Risk – What type of risk is most important to the RHCTF?

- Severe or unexpected price volatility (risk of short-term loss)
- Manager/asset class underperformance
- Inability to provide for spending needs
- Inability to meet short-term liquidity needs
- Prepared for certain economic scenarios
- Failure to achieve fully funded status

Risk Preferences – Trustees may have different risk tolerance levels:

- Performance compared to public fund peers
- Traditional investment approaches vs. unconventional approaches
- Level of illiquid investments
- Active vs. passive investments (high cost vs. low cost)
- Detailed understanding of a manager's investment position vs. a more general understanding of a manager's strategy within the context of the total Fund
- Level of diversification / concentration for the total Fund
- Headline risk
- Probability of meeting the assumed rate of return
- Length of time projected to meet fully funded status

Importance of Timeframe for Managing Different Types of Risk

Time Frame	Asset Class	Risk of Losing Money	Return Volatility	Risk of Failing to Achieve 7-8% Return Target	Underperformance Relative to Peers	Inability to Provide for Spending Needs
1 Year	Cash	Low	Low	High	High	Low
	Equities	High	High	Moderate	Moderate	Low
20 Years	Cash	Low	Low	High	High	High
	Equities	Low	Moderate	Low	Low	Low

- A remedy for one type of risk may amplify other types of risk, particularly over different time periods.
- The timeframe largely determines which types of strategies/assets best mitigate risk:
  - Mitigating short-term risk most often favors "conservative" investments, like cash or investment grade bonds.
  - Mitigating long-term risk most often favors "aggressive" investments, like equities.

Proposed Policy Options

Asset Allocation

What is Asset Allocation?

- Asset allocation refers to the distribution of assets across a number of asset classes that exhibit modest or low correlations with each other. Each asset class exhibits a unique combination of risk and reward. The expected and realized long-term returns vary by asset class, as does the interim volatility of those returns. Some asset classes, like equities, exhibit high degrees of volatility, but also offer high returns over time. Other asset classes, like cash, experience very little volatility, but offer limited return potential.

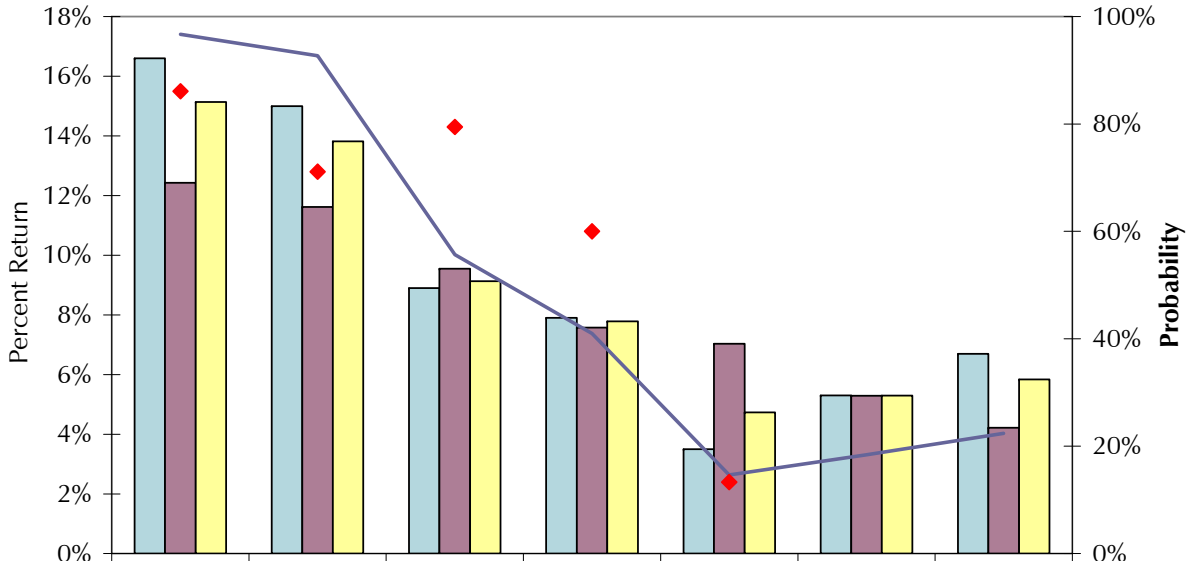
Why is Asset Allocation important?

- The distribution of assets across various asset classes exerts a major influence on the return behavior of the aggregate pool over short and long time periods.

How does Asset Allocation affect aggregate performance?

- In addition to exhibiting unique characteristics, each asset class interacts differently with other asset classes. Because of low correlations, the likelihood that any two asset classes will move together in the same direction is limited, with the movement of one asset class often offsetting another's. Combining asset classes allows investors to control more fully the aggregate risk and return of their portfolios, and to benefit from the reduction in volatility that stems from diversification.

The Persistent Decline in Investment Returns[1]

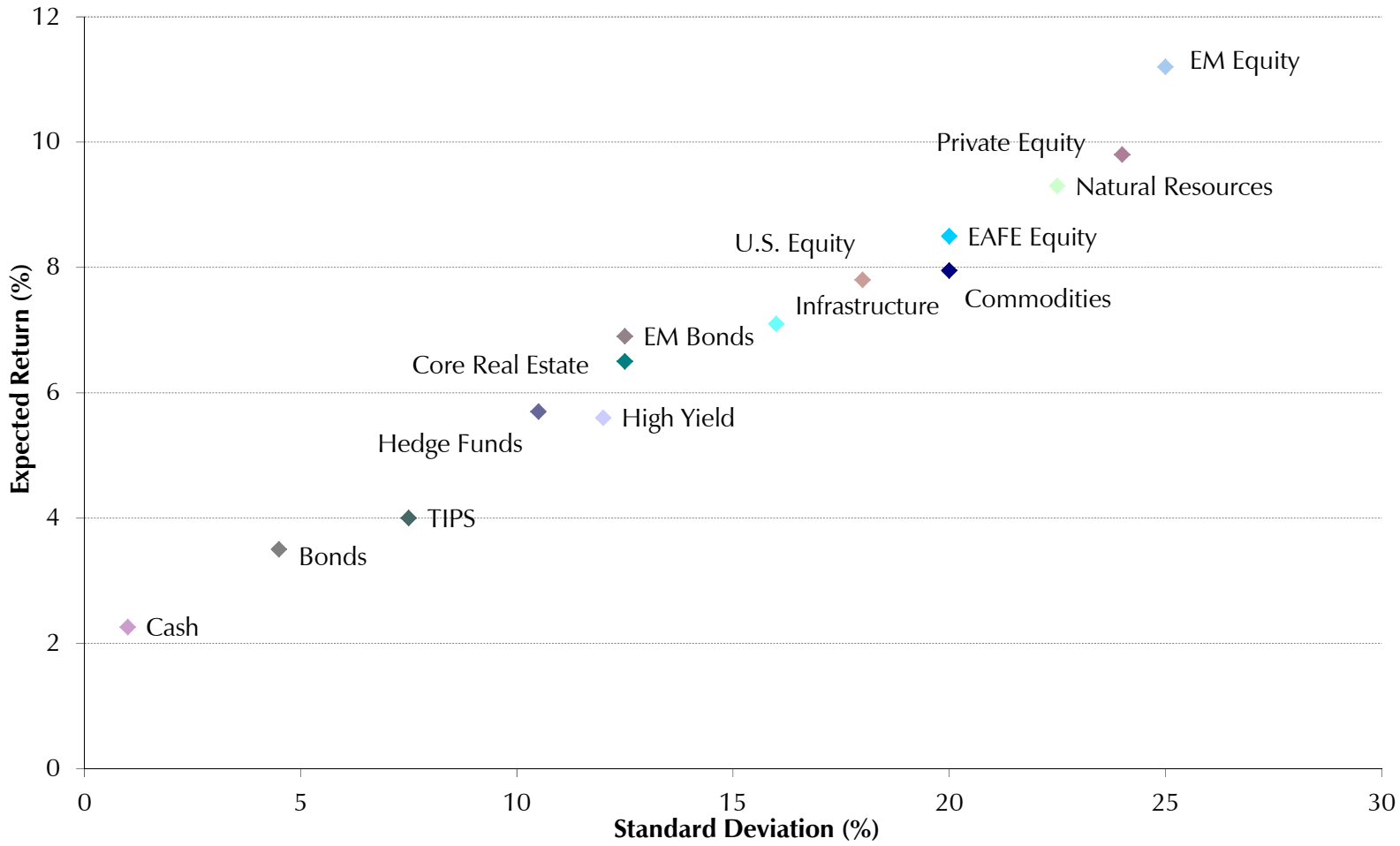


	1980	1985	1990	1995	2000	2005	2010
Equity Expected Return	16.6%	15.0%	8.9%	7.9%	3.5%	5.3%	6.7%
Bond Expected Return	12.4%	11.6%	9.6%	7.6%	7.0%	5.3%	4.2%
65/35 Eq/Bond Exp. Ret.	15.1%	13.8%	9.1%	7.8%	4.7%	5.3%	5.8%
Probability of earning 8%	97%	93%	56%	41%	15%	18%	22%
Actual 10-year Return	15.5%	12.8%	14.3%	10.8%	2.4%		

- A portfolio comprised of 65% domestic stocks and 35% investment grade bonds has produced diminishing expected returns as well as actual returns over the past thirty years.

[1] Expected return assumptions for 1) Bonds equals the yield of the ten-year Treasury plus 100 basis points, and 2) Equities equals the dividend yield plus the earnings yield of the S&P 500 index (using the inflation-adjusted trailing 10-year earnings). Probability calculation is for the subsequent ten years.

Expected Return and Volatility for Major Asset Classes[1]



- A positive correlation exists between long-term return expectations and the level of risk accepted.

[1] Expected return and standard deviation are based upon Meketa Investment Group's 2014 Annual Asset Study.

U.S. Equities

Asset Class Description

- U.S. Equities consist of public equities from the United States.
- The S&P 500 is an index based on the market capitalization of 500 large companies that captures a broad cross-section of businesses in the United States. Sectors include: Industrials, Consumer Discretionary, Energy, Materials, Telecommunication Services, Financials, Health Care, Consumer Staples, Utilities, and Information Technology.
- The Top 5 holdings in the S&P 500 are: Apple, ExxonMobil, Google, Microsoft, and Johnson & Johnson.
- The RHCTF has the sole option of investing in the S&P 500 excluding Tobacco. Performance for this fund is listed below.

Pros

- Participate in the GDP growth of the U.S. economy
- Positive correlation with inflation

Cons

- High volatility

Return History:

As of March 31, 2014	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 2/1/76	Standard Deviation	Correlation w/ MSCI EAFE
S&P 500	21.9%	14.7%	21.2%	7.4%	11.5%	17.0%	0.63
S&P 500 ex. Tobacco	19.7%	12.2%	18.6%	5.1%	NA	NA	NA

International Developed Equities

Asset Class Description

- International Developed Equities consist of public equities from developed markets outside of the United States.
- The index most often used to proxy this market is the MSCI EAFE Index.
- As of 4/31/14, the top 5 country exposures in the MSCI EAFE Index were the following: United Kingdom (22%), Japan (19%), France (11%), Germany (9%), and Switzerland (9%).
- The top 5 holdings in the MSCI EAFE are Nestle, Roche Holding Genuss, Novartis, HSBC, and BP.

Pros

- Diversification outside of the United States.
- Participate in the GDP growth of developed economies outside of the United States.

Cons

- High volatility.
- Tends to be highly correlated with the U.S. Stock market during times of market stress.

Return History:

As of March 31, 2014	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 2/1/91	Standard Deviation	Correlation w/ S&P 500
MSCI EAFE	17.6%	7.2%	16.0%	6.5%	9.9%	19.1%	0.63

Investment Grade Bonds

Asset Class Description

- Investment grade bonds consist of Treasury, Mortgage, and Corporate bonds.
- The index most often used to proxy this market is the Barclays Aggregate Index.
- The Barclays Aggregate, as of 3/31/14, was yielding 2.4%, with a duration (average bond term in the portfolio) of 5.7 years.

Pros

- Low correlation to traditional equity markets
- Stable income generation

Cons

- Performs poorly during low interest rate environments
- Low absolute return

Return History:

As of March 31, 2014	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 2/1/91	Standard Deviation	Correlation w/ S&P 500
Barclays Aggregate	-0.1%	3.7%	4.8%	4.5%	7.9%	5.9%	0.22

Comparison by Regional Composition of Public Equities

Region	U.S. Public Plans[1] (%)	SFERS[2] (%)	MSCI ACWI-IMI[3] (%)	Total World Wealth[4] (%)	GDP[5] (%)
United States	56	50	50	30	19
International	44	50	50	70	81
Developed Markets	*36*	*39*	*40*	*50*	*41*
Emerging Markets	*8*	*11*	*10*	*20*	*40*

- There are various ways to evaluate the composition of an equity allocation that is comprised of U.S. and international investments, including capitalization weighted indexes, global wealth estimates, GDP, and peers.
- The MSCI ACWI Investable Market Index (IMI) includes large, mid, and small cap equities from 23 developed market countries and 23 emerging market countries. The index is considered to be a broad market index that covers 99% of the global equity investment opportunity set.
- Meketa Investment Group recommends a 50/50 split between U.S. and international equities.
- Within international equities, based on global wealth estimates and GDP, Meketa favors a higher allocation to emerging markets relative to the MSCI ACWI IMI Index.

[1] Source: Greenwhich Associates
[2] SFERS target allocation for Global Equity includes 48% U.S. Equity, 47% International Equity, and 5% Global Equity. For this table, we estimated the breakdown of the 5% Global Equity to be 50/50, based on the MSCI ACWI IMI composition.
[3] As of May 2014.
[4] Source: Research Institute, James Davies, Rodrigo Lluberars and Anthony Shorrocks, Credit Suisse Global Wealth Databook 2013.
[5] 2012 gross domestic product adjusted for purchasing power parity. Source: IMF.

Asset Allocation Policy Options[1]

	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
U.S. Equities	21	26	31	37
International Developed Equities	21	26	31	37
Investment Grade Bonds	58	48	38	26
Cash	0	0	0	0
Expected Return (20 Year)	*6.0*	*6.5*	*7.0*	*7.5*
Standard Deviation	*8.3*	*10.0*	*11.7*	*13.8*
Sharpe Ratio	*0.7*	*0.7*	*0.6*	*0.5*

- All four policy portfolios have a 50/50 split between domestic and international equities.
- The major factor that changes between policy portfolios is the allocation amount to fixed income. The lower the fixed income allocation, the higher the expected return and risk, as defined by standard deviation.
- There is currently no option through SFERS passive strategies to invest in emerging market equities or debt, among other investable asset classes; areas of the market that could add diversification potential over time. We recommend considering investing in mutual funds or ETFs for these asset classes, once the initial asset allocation was made.

[1] Expected return and standard deviation are based upon Meketa Investment Group's 2014 Annual Asset Study. Throughout this document, returns for periods longer than one year are annualized.

Probability of Meeting the Expected Return

	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
Expected Return (20 Year)	*6.0*	*6.5*	*7.0*	*7.5*
Probability of Fund Return >				
6.0%	*49.0*	*58.1*	*63.9*	*68.2*
6.5%	*38.4*	*49.1*	*56.4*	*62.1*
7.0%	*28.7*	*40.2*	*48.7*	*55.7*
7.5%	*20.4*	*31.9*	*41.1*	*49.2*

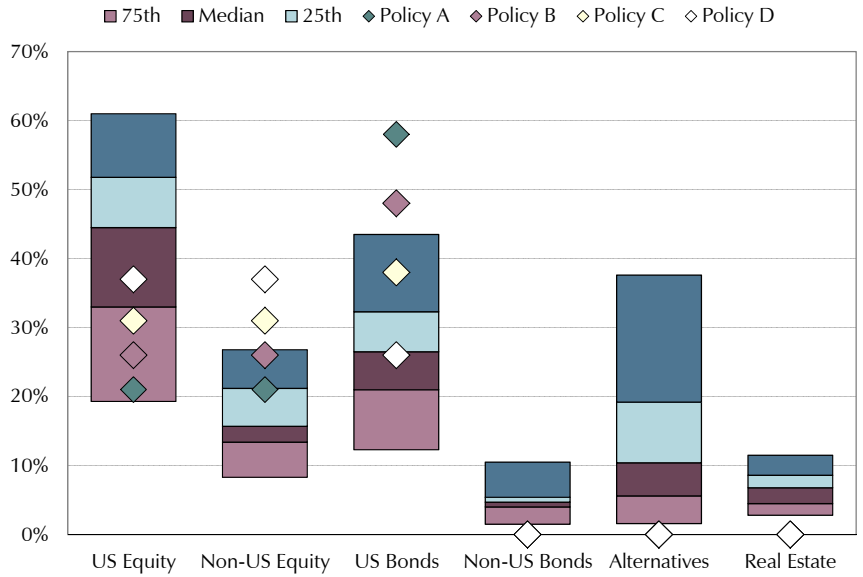
- The probability of meeting the expected return over a 20-year period is approximately 50%. Structuring a policy with an expected return greater than the assumed rate of return will result in an increased probability of achieving the assumed rate of return.

Probability of a Negative Return

	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
Expected Return (20 Year)	*6.0*	*6.5*	*7.0*	*7.5*
Probability of Fund Return < 0%				
1 Year	*23.0*	*25.1*	*26.9*	*28.6*
3 Year	*10.0*	*12.2*	*14.3*	*16.4*
5 Year	*4.9*	*6.7*	*8.4*	*10.3*
10 Year	*1.0*	*1.7*	*2.6*	*3.7*
20 Year	*0.1*	*0.1*	*0.3*	*0.6*

- For all four policies, the probability of a negative return over a 1-year period is likely, ranging from 23% to 29%, or about one out of four years.
- Over a three year period, the probability of a negative return decreases compared to a one year period.
- For five year time periods, the probability of a negative return is low, ranging from 5% to 10% in the policies presented.
- For time periods of ten to twenty years, the probability of a negative return is minimal.

Comparison to Public Peers
Current Allocation vs. IM All Public Plans Peer Universe[1]



	US Equity (%)	Non-US Equity (%)	US Bonds (%)	Non-US Bonds (%)	Alternatives (%)	Real Estate (%)
5th percentile	*61*	*27*	*44*	*11*	*38*	*12*
25th percentile	*52*	*2*	*32*	*5*	*19*	*9*
Median	*45*	*16*	*27*	*5*	*10*	*7*
75th percentile	*33*	*13*	*21*	*4*	*6*	*5*
95th percentile	*19*	*8*	*12*	*2*	*2*	*3*
Range for Policies A-D	*21-37*	*21-37*	*26-58*	*0*	*0*	*0*

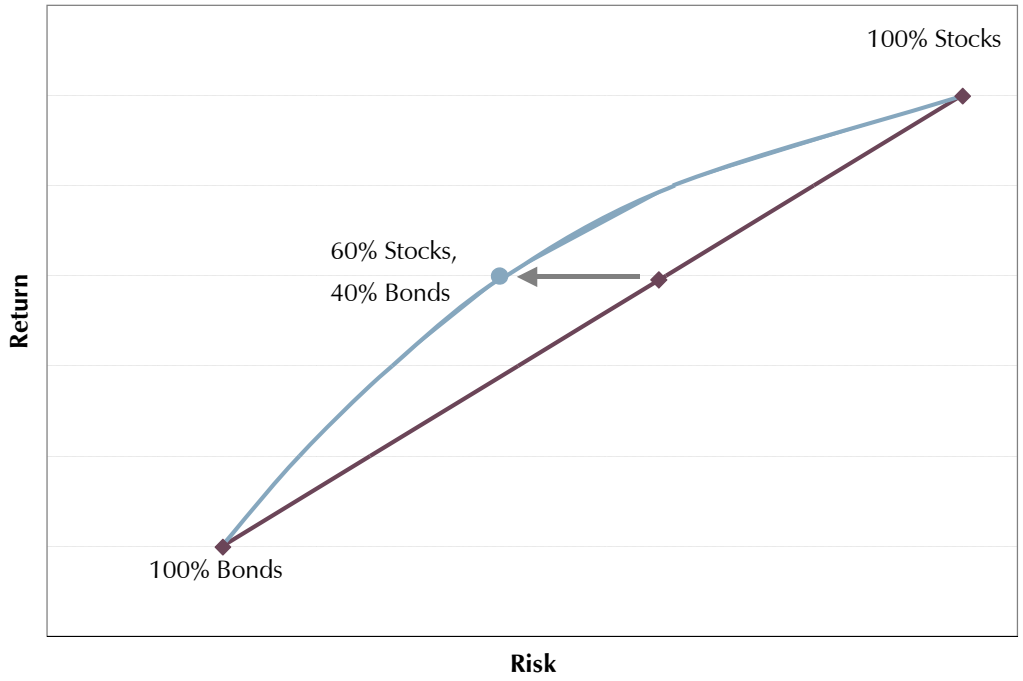
[1] Source: Investment Metrics. The Peer Universe was composed of 254 Public Plans as of March 31, 2014.

Mean Variance Optimization

Mean Variance Optimization

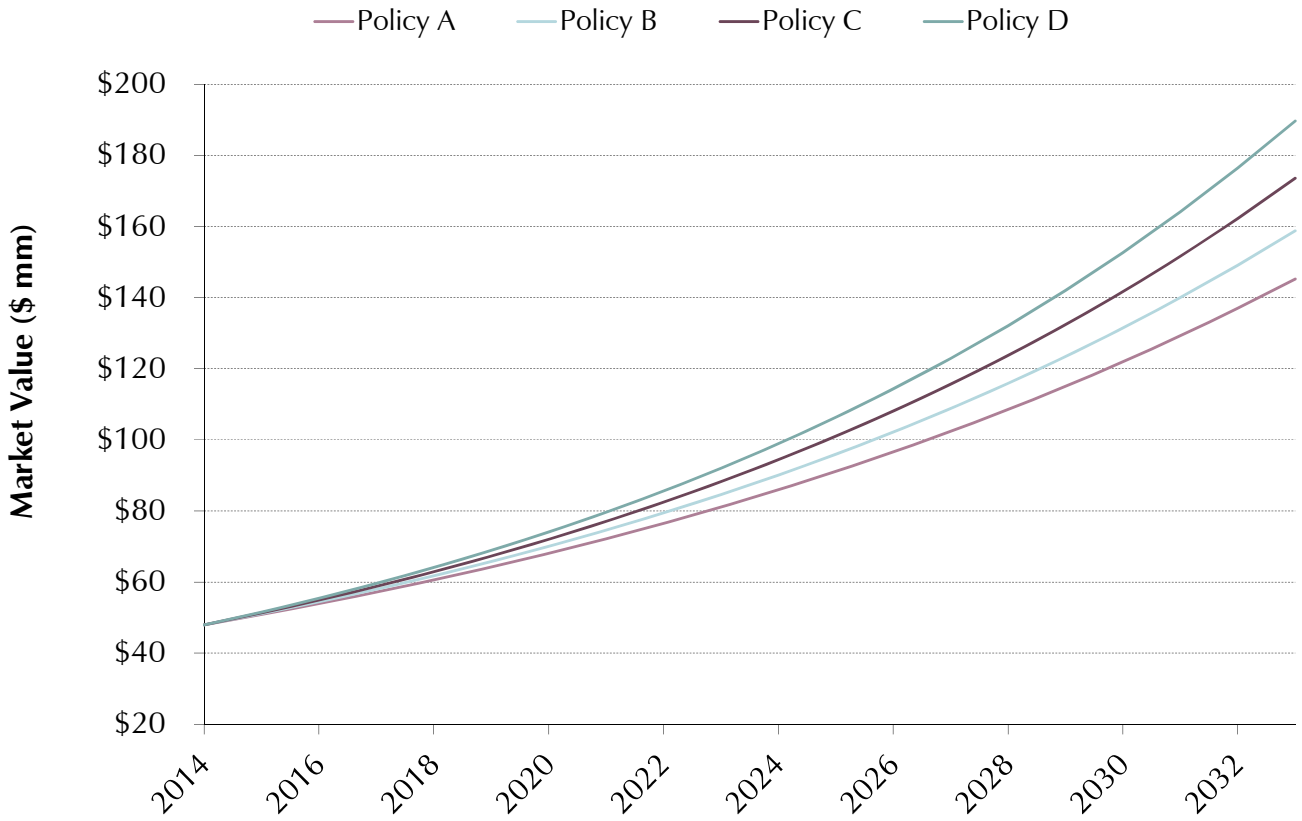
- Mathematically determines an "efficient frontier" of policy portfolios with the highest risk-adjusted returns.
- All asset classes exhibit only three characteristics, which serve as inputs to the model:
  - Expected return
  - Expected volatility
  - Expected covariance with all other assets
- The model assumes:
  - Normal return distribution
  - Stable volatility and covariances over time
  - Returns are not serially correlated
- The MVO Model tends to underestimate the risks of large negative events.

The Efficient Frontier



- Combining uncorrelated assets produces an "efficient frontier." Different combinations of assets (e.g., 60% stocks & 40% bonds) will lie along this efficient frontier.
- By combining assets that are not highly correlated with each other, the Fund can produce a higher return for a given level of risk than it could by investing in perfectly correlated assets. Alternatively, it can experience lower risk for a given level of return.

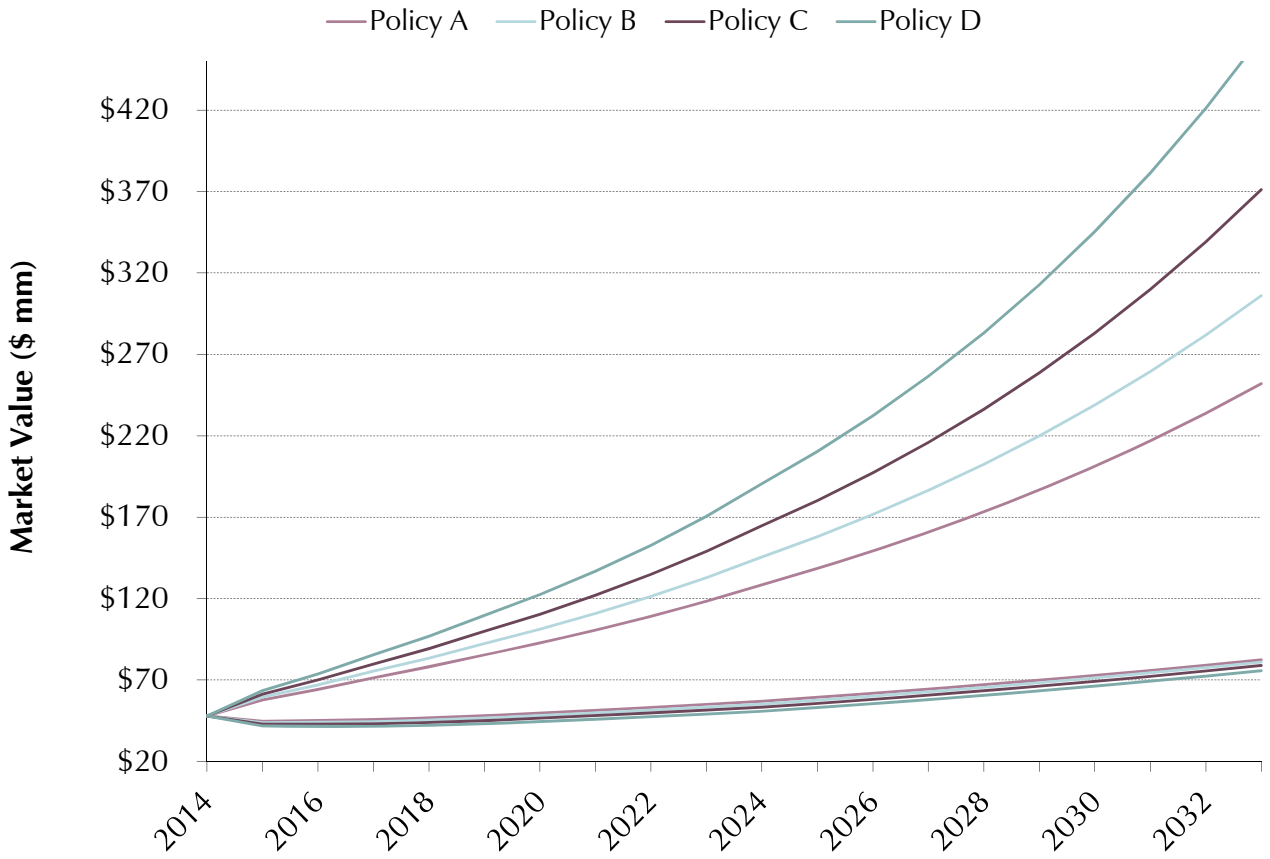
Growth of Assets[1]



- Even apparently small differences in expected returns can result in dramatic differences over long time periods. No contributions are assumed in this hypothetical chart- the market value is based solely on expected return.

[1] Assumes each policy option produces its expected return in each calendar year and no net outflows per annum.

Growth of Assets - 5th and 95th Percentiles[1]



- The range of possible outcomes will be driven predominantly by market performance.

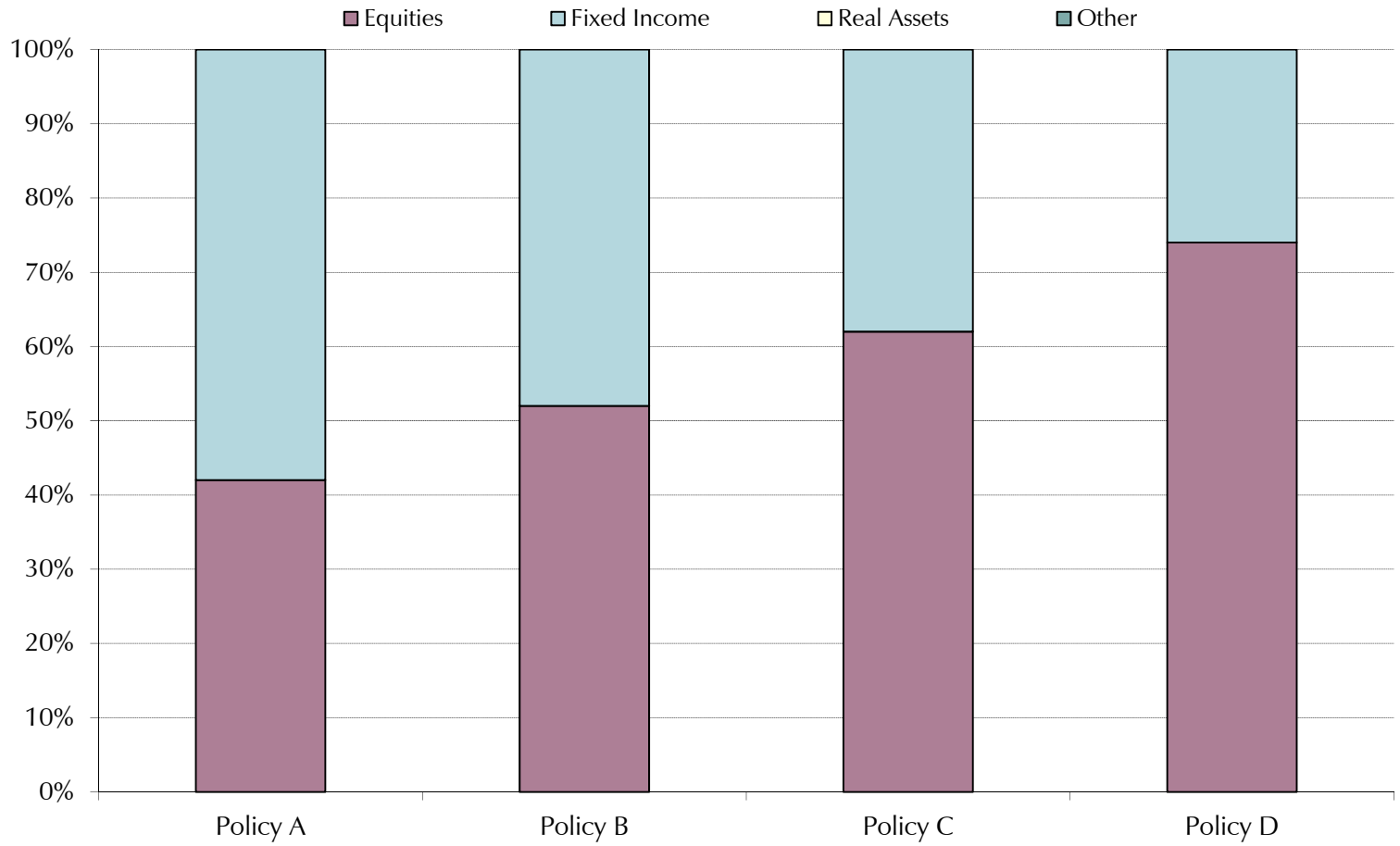
[1] Assumes each policy option produces returns at the 5th percentile and 95th percentile of possible outcomes and no net outflows per annum.

Diversification Analysis

Diversification

- The primary motive for diversifying a portfolio is to reduce risk.
- Diversification is the sole "free lunch" available to investors. That is, it represents the only way to reduce risk without reducing expected returns.
- Therefore, investments should be allocated across multiple classes of assets, based in part on the expected correlation of their returns.
- Within each asset type, investments should be distributed across different strategies and risk factors, so as to further reduce volatility.

Allocation by Asset Type[1]

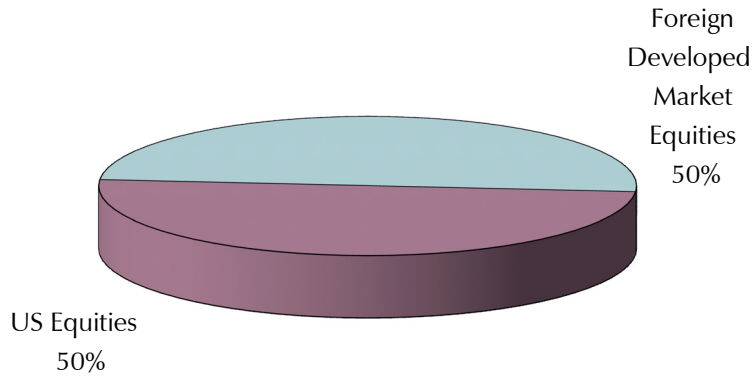


- Policy A invests the least in equities while Policy D invests the most.

[1] Other includes Hedge Funds (except long-short equities), Tactical Asset Allocation, and Risk Parity strategies.

Equity Diversification Comparison

Policy's A-D

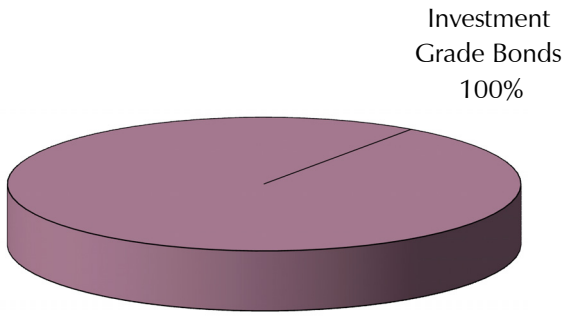


Expected Return	8.5%
Standard Deviation	18.5%
Sharpe Ratio	0.54

- The Equity portfolio may eventually be diversified to other equity assets classes, such as Emerging Markets, which would increase expected risk-adjusted returns.

Fixed Income Diversification Comparison

Policy's A-D



Expected Return	3.5%
Standard Deviation	4.5%
Sharpe Ratio	0.80

- The Fixed Income portfolio may eventually be diversified to other fixed income assets classes, such as TIPS, High Yield Bonds, Bank Loans, and Emerging Market Debt, which would increase expected risk-adjusted returns.

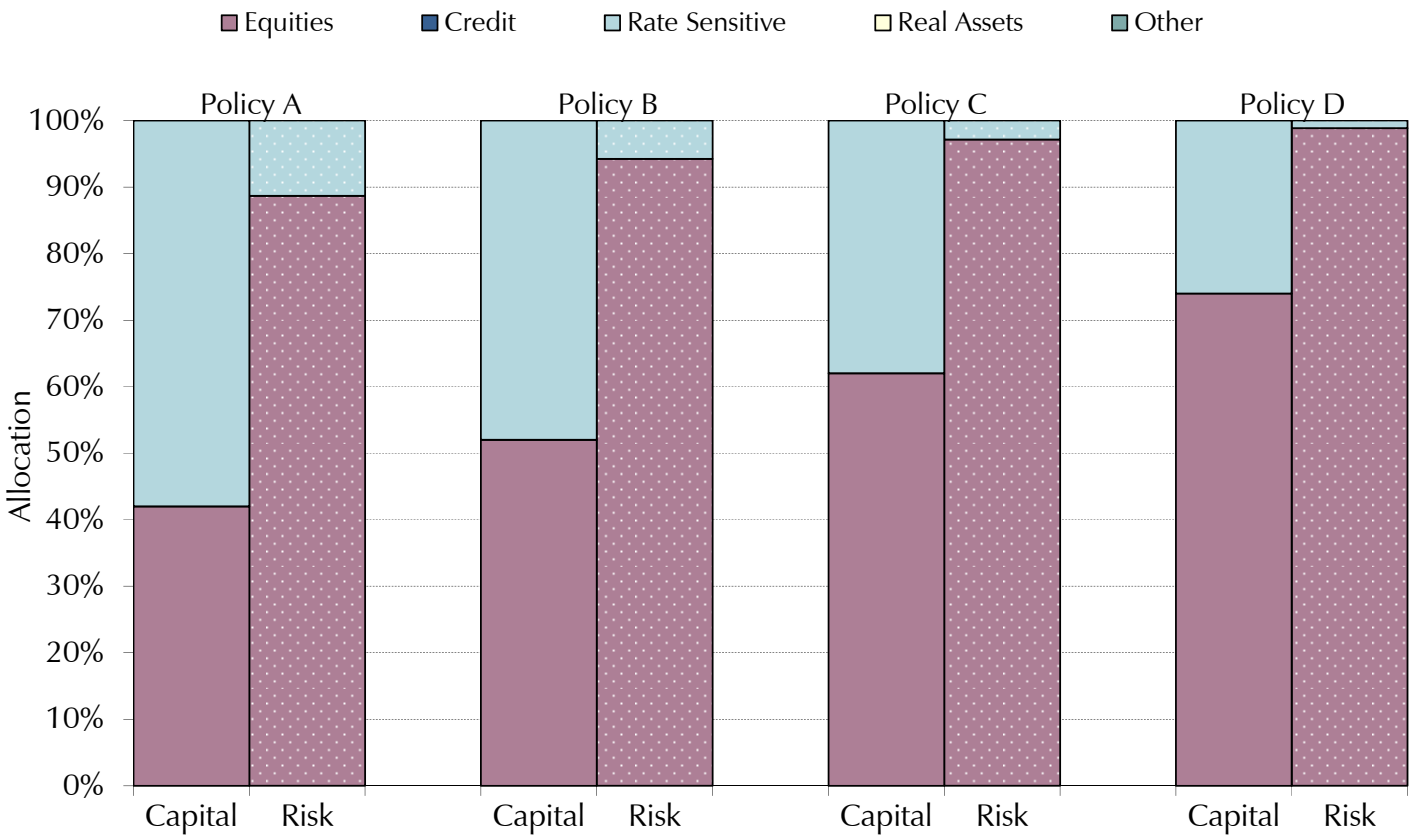
Risk Analysis

Types of Risk Analysis Addressed

- Risk budgeting[1]
  - Attributes overall portfolio risks to specific asset classes
  - Highlights the source and scale of portfolio-level risk
- MVO-based risk analytics
  - Includes worst-case return expectations and Value at Risk (VAR)[2]
  - Relies on assumptions underlying MVO
- Scenario analysis
  - Stress tests policy portfolios using actual historical examples
  - Stress tests policy portfolios under specific hypothetical scenarios

[1] Risk budgeting seeks to decompose the aggregate risk of a portfolio into different sources (in this case, by asset class), with risk defined as standard deviation.
[2] VaR is a risk measure that estimates the maximum loss on a portfolio over a given time horizon and a given confidence level (usually 95% or 99%).

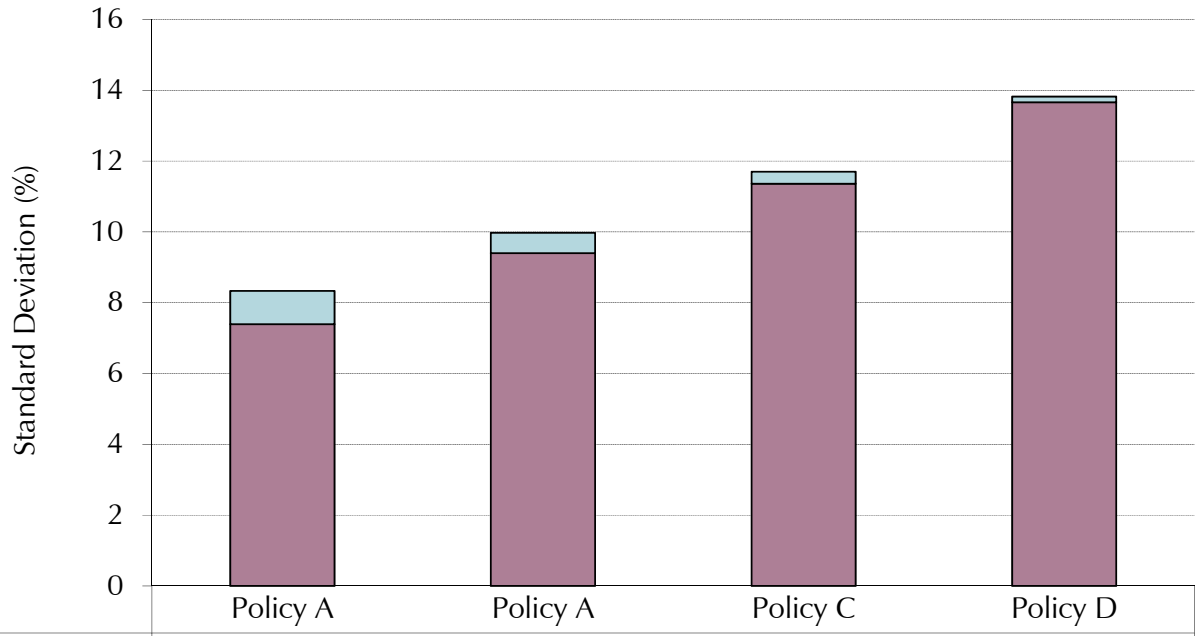
Risk Budgeting Analysis[1]
(Capital Allocation vs. Risk Allocation)



- Assets with low relative volatility, such as fixed income, contribute less to risk than their asset weighting implies.

[1] Other includes Hedge Funds (except long-short equities), Tactical Asset Allocation, and Risk Parity strategies. Risk allocation is calculated by multiplying the weight of the asset class by its standard deviation and its correlation with the total portfolio and then dividing this by the standard deviation of the total portfolio.

Risk Budgeting Analysis[1]
(Absolute Contribution to Risk)



	Policy A	Policy A	Policy C	Policy D
Other	0.0	0.0	0.0	0.0
Real Assets	0.0	0.0	0.0	0.0
Fixed Income	0.9	0.6	0.3	0.2
Equities	7.4	9.4	11.4	13.7

- In each policy option, equity risk dominates the risk profile of the portfolio.

[1] Other includes Hedge Funds (except long-short equities), Tactical Asset Allocation, and Risk Parity strategies. Contribution to risk is calculated by multiplying the weight of the asset class by its standard deviation and its correlation with the total portfolio.

MVO-Based Risk Analysis

Scenario:	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
Expected Return	*6.0*	*6.5*	*7.0*	*7.5*
"Worst Case" Returns[1]:				
One Year	-13.4	-16.3	-19.1	-22.6
Three Years *(annualized)*	-5.7	-7.3	-9.0	-11.1
Five Years *(annualized)*	-3.2	-4.4	-5.6	-7.2
Ten Years *(annualized)*	-0.6	-1.3	-2.1	-3.1
Probability of Experiencing Negative Returns				
One Year	23.0	25.1	26.9	28.6
Three Years	10.0	12.3	14.3	16.4
Five Years	4.9	6.7	8.4	10.3
Ten Years	1.0	1.7	2.6	3.7

- Given the higher allocation to fixed income, Policy A is the most defensive portfolio.
- For all four policies, the probability of a negative return over a 1-year period is likely, ranging from 23% to 29%, or about one out of four years.
- For five year time periods, the probability of a negative return is low, ranging from 5% to 10% in the policies presented.

[1] "Worst Case" Return Projections encompass 99% of possible outcomes.

Value at Risk[1]

Scenario:	Policy A	Policy B	Policy C	Policy D
Expected Return (%)	*6.0*	*6.5*	*7.0*	*7.5*
Value at Risk (%)				
One Month	-5.1	-5.1	-6.1	-7.2
Three Months	-8.2	-8.2	-9.8	-11.7
One Year	-13.3	-13.1	-15.9	-19.5
Three Years *(annualized)*	-5.0	-3.0	-4.0	-5.5
Value at Risk ($mm)				
One Month	-2	-2	-3	-3
Three Months	-4	-4	-5	-6
One Year	-6	-6	-8	-9
Three Years	-8	-10	-12	-14
Five Years	-8	-10	-12	-15

- Based on Value at Risk analysis, over a one year period, the policies presented have a 1% likelihood of decreasing in value more than the range of -13% (Policy A) to -20% (Policy D).

[1] Calculated with a 99% confidence level and based upon Meketa Investment Group's 2014 Annual Asset Study.

Historical Scenario Analysis[1]

(*Cumulative* Return)

Scenario:	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
Calendar Year 2008	-13.9	-18.5	-23.0	-28.5
Global Financial Crisis (4Q07 thru 1Q09)	-15.7	-21.4	-27.2	-34.1
Interest Rate Spike (1994)	0.0	0.7	1.4	2.2
Crash of 1987 (September thru November 1987)	-8.1	-10.5	-12.9	-15.9
Popping of the dot.com Bubble (2Q00 thru 3Q02)	-2.3	-9.6	-17.0	-25.8
Strong US Dollar (1Q81 through 3Q82)	6.7	4.5	2.2	-0.5
Weak US Dollar (January 1986 thru August 1987)	26.0	30.2	34.4	39.4
Stagflation (January thru March 1980)	-7.9	-7.7	-7.4	-7.2
Stagflation (1Q73 thru 3Q74)	-16.3	-20.8	-25.4	-30.8

- High equity allocation policies suffer the most under most historical scenarios.

[1] See the Appendix for our scenario inputs. In periods where the ideal benchmark was not yet available we used the next closest benchmark(s) as a proxy.

Stress Testing: Impact of Market Movements

(Expected Return under Stressed Conditions)[1]

What happens if (over a 12-month period):	Policy A (%)	Policy B (%)	Policy C (%)	Policy D (%)
10-Year T-Bond rates rise 100 bp	2.4	3.8	5.1	6.8
10-Year T-Bond rates rise 200 bp	-1.4	0.4	2.2	4.4
10-Year T-Bond rates rise 300 bp	-5.5	-3.4	-1.2	1.3
BBB Spreads widen by 50 bp, HY by 200 bp	2.3	2.9	3.5	4.2
BBB Spreads widen by 300 bp, HY by 1000 bp	-18.4	-21.7	-25.0	-28.9
Trade-weighted US$ gains 10%	3.9	2.9	2.0	0.8
Trade-weighted US$ gains 20%	7.8	5.9	3.9	1.6
Equities decline 10%	-3.1	-4.4	-5.6	-7.1
Equities decline 25%	-7.9	-10.9	-14.0	-17.7
Equities decline 40%	-12.6	-17.5	-22.4	-28.3

- Each policy portfolio has a different sensitivity to four major risk factors: interest rates, credit spreads, currency values, and equity values.
- The Fund's primary risk factor would continue to be an equity market decline, no matter the policy.

[1] Assumes that assets not directly exposed to the factor are affected nonetheless. See the Appendix for further details.

Economic Regime Management

- ERM recognizes that macroeconomic regimes are a major risk factor when allocating assets.
- ERM demonstrates the impact that fundamental economic conditions have on investment portfolios.
- ERM allows Funds to test investment returns through a variety of economic regimes.

Example of Asset Return Dependence on Economic Conditions
Annualized Total Return
1971-2011[1]

	U.S. GDP		U.S. CPI	
	High	Low	High	Low
Equities	12.8%	3.1%	8.9%	10.1%
Bonds	5.8%	11.8%	5.4%	9.2%

- Over the last four decades, equity and bond returns have been highly dependent on the level of economic growth (GDP) and inflation (CPI).
- In high GDP "states," equities do much better than bonds. In low GDP "states," bonds outperform.
- Lower inflation (CPI) favors both stocks and bonds.

[1] Equity returns are represented by the S&P 500 index, and bond returns by the Ibbotson intermediate government bond index from 1971 to 1976 and the Barclay's Aggregate index thereafter. The index returns are categorized into "high" and "low" states based on the deviation of each factor (GDP, CPI) from its long-term average level.

ERM Scenario Testing[1]

	2014	2015	2016	2017	2018
European Sovereign Debt Crisis					
Policy D Total Return	9.7%	-18.4%	-7.5%	18.8%	13.3%
Policy D Market Value (Year End[2], millions)	$52.7	$43.0	$39.7	$47.2	$53.5
China Hard Landing / Regime Change					
Policy D Total Return	-11.0%	-3.1%	19.7%	10.6%	5.3%
Policy D Market Value (Year End, millions)	$42.7	$41.4	$49.6	$54.9	$57.8
Japanese Yen Depreciation					
Policy D Total Return	-13.0%	14.2%	6.8%	11.1%	1.7%
Policy D Market Value (Year End, millions)	$41.7	$47.7	$50.9	$56.6	$57.5
Global Oil Stock					
Policy D Total Return	-18.1%	14.8%	9.6%	2.6%	14.0%
Policy D Market Value (Year End, millions)	$39.3	$45.1	$49.4	$50.7	$57.8
Central Bank-Induced Inflation					
Policy D Total Return	9.4%	23.2%	-17.0%	-8.9%	5.6%
Policy D Market Value (Year End, millions)	$52.5	$64.7	$53.7	$48.9	$51.6

- Every negative scenario has a different drawdown and timeframe.

[1] The five scenarios shown are a sample of negative scenarios that Meketa Investment Group has developed based on the conditions of the global capital markets in 2014. Meketa Investment Group modeled Policy D's asset class returns in each scenario based on the historical relationship each has had with changes to fundamental economic conditions.

[2] Assumes an initial Fund value of $48 million, and no net cash outflows per year.

ERM Scenario 1: Uncontrolled Dissolution of the Euro Currency

	Rf	Russell 3000	Portable Alpha	MSCI EAFE	MSCI EAFE SC	MSCI EM	HFRI FOF Composite	Barclays Aggregate	Barclays US TIPS	Barclays High Yield	CSFB Leveraged Loans	Barclays High Yield	FTSE EPRA/NAREIT Global REIT	S&P North American NR	Dow Jones - UBS Commodities	DJ Brookfield Global Infastructure
Year1	2.0%	10.0%	12.1%	13.4%	12.9%	18.2%	5.9%	4.0%	5.3%	-2.3%	-3.2%	-2.3%	6.1%	11.8%	4.9%	11.9%
Year2	1.0	-29.6	-36.6	-29.8	-29.8	-40.5	-20.9	13.8	8.3	-19.9	-13.7	-19.9	-24.2	-25.5	-20.3	-24.4
Year3	1.0	-11.6	-14.9	-18.6	-17.0	-31.4	-7.9	14.2	8.2	-17.9	-6.7	-17.9	-6.8	-16.6	-11.5	-17.7
Year4	2.0	24.5	31.4	27.5	24.4	47.2	14.8	-1.8	2.6	17.6	8.4	17.6	10.4	22.8	23.6	28.5
Year5	3.0	13.2	15.9	18.4	16.8	30.9	8.4	6.0	5.3	8.1	5.7	8.1	8.1	15.2	21.7	20.0
Weights	0%	37%	0%	37%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	0%
	Portfolio Returns		$48.0													
Year1	9.7		$52.7													
Year2	-18.4		$43.0													
Year3	-7.5		$39.7													
Year4	18.8		$47.2													
Year5	13.3		$53.5													

- Progressively worse outlooks for economic activity in the periphery of Europe cause growing demands from Portugal, Spain, and Italy for more financial support from the ECB and IMF. The peripheral countries are unable to implement the necessary austerity measures demanded by the monetary authorities, causing a rapid succession of political regime changes in these countries, followed by each country choosing to exit the euro and return to legacy currencies. The exits from the euro (and the subsequent defaults of euro-denominated debt) cause a global banking crisis. Equity markets are down 40% to 50% in the developed world, and down more than 60% in the developing world. Interest rates on "safe haven" currencies (U.S. Treasuries, JGB, German Bunds) collapse to near zero at all maturities. Global GDP shrinks by 3% in 2015, led by Europe with a contraction of 8% for the year. Markets are highly volatile until 2017, when a sustained recovery begins.

ERM Scenario 2: Hard Landing in China

	Rf	Russell 3000	Portable Alpha	MSCI EAFE	MSCI EAFE SC	MSCI EM	HFRI FOF Composite	Barclays Aggregate	Barclays US TIPS	Barclays High Yield	CSFB Leveraged Loans	Barclays High Yield	FTSE EPRA/NAREIT Global REIT	S&P North American NR	Dow Jones - UBS Commodities	DJ Brookfield Global Infastructure
Year1	1.0%	-17.7%	-22.8%	-19.3%	-18.8%	-24.2%	-13.0%	10.4%	5.4%	-10.1%	-12.9%	-10.1%	-9.8%	-26.8%	-36.8%	-16.6%
Year2	1.0	-6.4	-8.8	-7.1	-10.3	-9.1	-1.1	7.5	2.7	0.3	-5.7	0.3	-5.4	-6.5	-14.0	-9.7
Year3	1.0	25.2	32.8	27.4	20.1	36.3	10.2	1.0	2.8	10.6	10.2	10.6	9.7	24.2	41.4	7.9
Year4	2.0	17.6	21.9	9.4	7.3	19.3	8.9	2.4	5.6	5.7	3.8	5.7	6.7	17.0	5.5	3.4
Year5	3.0	6.0	5.7	5.8	-1.8	8.1	6.5	3.7	8.3	5.9	5.0	5.9	4.8	12.7	19.7	8.6
Weights	0%	37%	0%	37%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	0%
	Portfolio Returns		$48.0													
Year1	-11.0%		$42.7													
Year2	-3.1		$41.4													
Year3	19.7		$49.6													
Year4	10.6		$54.9													
Year5	5.3		$57.8													

- As 2014 progresses there is increasing evidence that the slow down in China is evolving into a full fledged collapse. Triggered by a drop off in export demand from Europe, Chinese investment plummets and domestic consumption falls as economic uncertainty elevates. The GDP slowdown is amplified by capital flight from the country, as investors try to get their money out of RMB before an anticipated currency depreciation. GDP growth in China declines to 2% from an anticipated growth of 8%. Demand for commodities globally collapses, as does corporate investment, causing a sharp slowdown in global GDP growth. Global GDP growth is flat for 2015. Equity markets around the world are down 20% to 25%, with emerging markets down over 30%. However, the slow down is short-lived, as China enacts policies to boost investment and aggregate demand. By early 2016, the global economy is growing strongly again.

ERM Scenario 3: Japanese Yen Depreciation

	Rf	Russell 3000	Portable Alpha	MSCI EAFE	MSCI EAFE SC	MSCI EM	HFRI FOF Composite	Barclays Aggregate	Barclays US TIPS	Barclays High Yield	CSFB Leveraged Loans	Barclays High Yield	FTSE EPRA/NAREIT Global REIT	S&P North American NR	Dow Jones - UBS Commodities	DJ Brookfield Global Infastructure
Year1	1.0%	-23.7%	-29.1%	-24.2%	-37.6%	-29.7%	-15.5%	18.1%	5.6%	-19.6%	-7.2%	-19.6%	-26.4%	-34.7%	-18.7%	-18.8%
Year2	1.0	16.4	24.4	26.2	24.5	36.6	6.2	-6.0	2.7	5.7	3.0	5.7	10.2	24.0	7.5	11.4
Year3	2.0	7.2	12.2	9.1	11.5	12.1	5.2	2.8	5.6	4.6	3.6	4.6	5.0	10.5	4.2	6.3
Year4	3.0	11.8	17.3	15.3	18.9	11.5	8.1	4.2	5.7	7.2	5.4	7.2	8.1	17.3	6.7	14.9
Year5	4.0	2.4	5.1	-1.2	5.7	1.8	6.9	4.6	11.5	5.9	5.9	5.9	2.7	3.8	3.1	9.0
Weights	0%	37%	0%	37%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	0%
	Portfolio Returns		$48.0													
Year1	-13.0%		$41.7													
Year2	14.2		$47.7													
Year3	6.8		$50.9													
Year4	11.1		$56.6													
Year5	1.7		$57.5													

- After more than two decades of deficit spending to recover from devastating deflation, the weight of Japan's government debt becomes to heavy to support. Growing trade deficits, caused by an aging population and declining global competitiveness, force the government to finance its debt increasingly through foreign sources. While initially successful, by late 2015, the foreign capital becomes weary of Japan's finances and capital flight ensues. Within two months, the yen is devalued by 40%, causing a massive devaluation of Japanese assets held by foreigners. The rapid devaluation sparks a credit crisis in Asia that spreads to banks around the world. Global GDP slows to 2%, and Asian emerging markets experience more severe GDP losses. Investors flock to the relative safety of Treasuries, pushing interest rates lower. Global equity markets are down 20% to 30%, with much more severe losses focused on Japan and the Asian emerging markets. However, recovery is strong and by 2016, most of the losses have been recovered.

ERM Scenario 4: Global Oil Shock

	Rf	Russell 3000	Portable Alpha	MSCI EAFE	MSCI EAFE SC	MSCI EM	HFRI FOF Composite	Barclays Aggregate	Barclays US TIPS	Barclays High Yield	CSFB Leveraged Loans	Barclays High Yield	FTSE EPRA/NAREIT Global REIT	S&P North American NR	Dow Jones - UBS Commodities	DJ Brookfield Global Infastructure
Year1	1.0%	-26.2%	-31.4%	-29.5%	-27.9%	-38.0%	-16.4%	9.5%	11.0%	-15.0%	-8.4%	-15.0%	-29.2%	12.9%	72.7%	-19.2%
Year2	2.0	25.6	32.5	18.1	25.2	29.4	16.3	-5.4	-4.3	9.5	5.7	9.5	17.5	-4.5	-40.5	12.7
Year3	3.0	13.0	15.3	9.8	14.4	23.1	7.0	4.4	7.0	6.6	4.9	6.6	10.0	13.4	6.3	6.8
Year4	4.0	-0.3	-2.2	0.6	2.6	1.9	-2.0	9.5	7.2	3.1	3.7	3.1	1.6	1.3	-6.9	-0.2
Year5	5.0	18.7	21.7	14.2	21.4	28.3	11.1	7.0	11.4	10.1	7.6	10.1	14.7	19.7	20.9	17.4
Weights	0%	37%	0%	37%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	0%
	Portfolio Returns		$48.0													
Year1	-18.1%		$39.3													
Year2	14.8		$45.1													
Year3	9.6		$49.4													
Year4	2.6		$50.7													
Year5	14.0		$57.8													

- Prompted by slow progress in containing Iran's nuclear ambitions, Israel launches a series of attacks on Iran's nuclear establishment. The surprise attacks send oil prices up nearly 100% in a four week period. Coordinated releases of strategic oil reserves do not calm the markets. The higher price of oil sends gasoline prices in the U.S. to over $7 per gallon, stunting GDP growth. Global trade slows meaningfully, and countries in the emerging markets that subsidize domestic oil consumption see a rapid depletion of their currency reserves. Equity markets are down 25% to 35% globally, with emerging markets sharing equally in the pain. Inflation spikes globally, causing bond yields to rise. However, within 6 months, a new Israeli government is formed and renounces the attacks, bringing relative calm to the region. Oil prices are brought back to current levels and markets recover quite sharply.

ERM Scenario 5: Glut of Printed Money

	Rf	Russell 3000	Portable Alpha	MSCI EAFE	MSCI EAFE SC	MSCI EM	HFRI FOF Composite	Barclays Aggregate	Barclays US TIPS	Barclays High Yield	CSFB Leveraged Loans	Barclays High Yield	FTSE EPRA/NAREIT Global REIT	S&P North American NR	Dow Jones - UBS Commodities	DJ Brookfield Global Infastructure
Year1	1.0%	9.9%	10.7%	23.0%	24.9%	14.1%	9.1%	-10.7%	-8.8%	2.0%	0.8%	2.0%	5.4%	9.1%	4.5%	9.2%
Year2	4.0	31.4	37.7	37.2	47.5	46.2	21.5	-8.3	3.8	19.8	25.4	19.8	20.9	67.7	54.5	26.9
Year3	12.0	-21.2	-29.4	-29.4	-12.7	-20.5	-6.9	6.5	24.7	-16.5	6.0	-16.5	-28.6	46.4	33.4	0.5
Year4	10.0	-19.0	-26.3	-8.9	-13.2	-17.4	-11.4	5.5	15.3	-5.8	-3.6	-5.8	-10.9	-21.6	11.8	-5.2
Year5	8.0	10.3	10.1	1.2	9.3	8.4	-0.8	5.1	5.7	5.2	8.6	5.2	1.5	-2.3	-16.6	3.5
Weights	0%	37%	0%	37%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%	0%
	Portfolio Returns		$48.0													
Year1	9.4%		$52.5													
Year2	23.2		$64.7													
Year3	-17.0		$53.7													
Year4	-8.9		$48.9													
Year5	5.6		$51.6													

- As 2014 unfolds, it becomes increasingly clear that the US recovery is become self-reinforcing and strong. Further, Europe has temporarily solved its short-term sovereign financing issues, and China begins a new cycle of rapid growth. However, central bankers around the world, appeasing politicians still dealing with unemployment concerns, continue to keep interest rates very low and enact several more rounds of quantitative easing. Slowly at first, bank lending accelerates and by early 2015, securitized markets in the U.S. and Europe begin growing rapidly. The money supply jumps by 30% in a few quarters in the major economies around the world. While the flood of money is initially positive for equity markets (up over 40% in much of the world by mid 2015), rapid inflation begins to appear. By the end of 2015, U.S. CPI is growing at an 8% annualized rate and similar levels are seen in Europe. The emerging markets experience double digit inflation. Bond markets push interest rates much higher in a short period of time and central banks begin a delayed strategy to snuff out inflation by manufacturing a global recession. Interest rates in the US peak at 12% in early 2016, and the subsequent recession causes equity markets to fall between 30% and 40% over a two year period. Only after 2018 do markets stabilize.

Recommendations

Recommendations

- Each of the four policies presented include three asset classes: domestic equities, international equities, and investment grade bonds. For the equity allocation, Meketa Investment Group recommends a 50/50 split between domestic and international equities.
- Meketa recommends selecting an asset allocation policy with an appropriate expected return and level of risk for the RHCTF.

Appendices

Notes and Disclaimers

[1] The returns shown in the Policy Options and Risk Analysis sections rely on estimates of expected return, standard deviation, and correlation developed by Meketa Investment Group. To the extent that actual return patterns to the asset classes differ from our expectations, the results in the table will be incorrect. However, our inputs represent our best unbiased estimates of these simple parameters.

[2] The returns shown in the Policy Options and Risk Analysis sections use a lognormal distribution, which may or may not be an accurate representation of each asset classes' future return distribution. To the extent that it is not accurate in whole or in part, the probabilities listed in the table will be incorrect. As an example, if some asset classes' actual distributions are even more right-skewed than the lognormal distribution (i.e., more frequent low returns and less frequent high returns), then the probability of the portfolio hitting a given annual return will be lower than that stated in the table.

[3] The standard deviation bars in the chart in the Risk Analysis section do not indicate the likelihood of a 1, 2, or 3 standard deviation event—they simply indicate the return we expect if such an event occurs. Since the likelihood of such an event is the same across allocations regardless of the underlying distribution, a relative comparison across policy choices remains valid.

Scenario Return Inputs

Asset Class	Benchmark Used
Investment Grade Bonds	Barclays Aggregate
TIPS	Barclays US TIPS
Intermediate-term Government Bonds	Ibbotson US Intermediate Government
Long-term Government Bonds	Barclays Long Term Treasury
EM Bonds	JPM GBI-EM Global Diversified
Bank Loans	CSFB Leveraged Loan
High Yield Bonds	Barclays High Yield
Core Real Estate	NCREIF Property
Value-Added RE	NCREIF Townsend Value Added
Opportunistic RE	NCREIF Townsend Opportunistic
REITs	NAREIT Equity
Infrastructure (private)	S&P Global Infrastructure
Natural Resources (private)	S&P Global Natural Resources
Timber	NCREIF Timberland
Commodities	Summer Haven Commodity
US Equity	Russell 3000
Public Foreign Equity (Developed)	MSCI EAFE
Public Foreign Equity (Emerging)	MSCI Emerging Markets
Private Equity	Venture Economics Private Equity Composite
Long-short Equity	HFRI Equity Hedge
Global Macro	HFRI Macro
Hedge Funds	HFRI Fund of Funds Composite

Scenario Return Inputs

	GFC (%)	2008 (%)	Rate spike (1994) (%)	LTCM (July - Aug 1998) (%)	Crash of '87 (Sept - Nov 1987) (%)	Popping of the TMT Bubble (2q00 - 3q02) (%)	Strong dollar (1q81-3q82) (%)	Plummeting Dollar (Jan 1986 - Aug 87) (%)	Stagflation (1q80) (%)	Stagflation (1q73-3q74) (%)
Investment Grade Bonds	8.5	5.2	-2.9	1.8	2.2	28.6	16.1	8.4	-8.7	2.8
Short-term Bonds	7.9	5.0	0.5	1.6	2.3	21.9	29.9	13.2	-2.6	8.1
TIPS	8.2	-2.4	0.2	0.7	3.3	37.4	20.5	17.0	-2.7	14.6
LT Govt Bonds	24.2	24.0	-7.6	4.1	2.6	35.5	28.4	15.4	-13.6	-1.8
EM Bonds (local)	-7.9	-5.2	-10.3	-29.9	-9.1	6.3	-1.8	41.7	-7.3	-31.3
EM Bonds (major)	-5.0	-9.7	-18.9	-28.2	-9.1	6.3	2.6	22.9	-7.3	-31.3
Foreign Bonds	2.0	4.4	5.3	3.5	2.3	8.5	27.3	24.5	-2.8	8.1
Bank Loans	-23.7	-28.8	10.3	0.7	-3.6	6.3	7.1	14.3	-7.5	-19.9
High Yield Bonds	-22.8	-26.2	-1.0	-5.0	-3.6	-6.3	7.1	14.3	-7.5	-19.9
Core Real Estate	-23.9	-14.7	6.4	0.0	2.1	23.5	13.0	6.8	5.5	-16.1
Value-Added RE	-52.5	-19.4	7.5	0.0	1.6	28.1	15.6	8.2	6.6	-19.3
Opportunistic RE	-53.9	-36.4	9.4	0.0	1.7	31.3	17.2	9.0	7.3	-21.2
REITs	-63.0	-37.7	3.2	-15.3	-14.0	45.4	5.6	16.2	-4.4	-31.6
Infrastructure	-28.1	-23.4	-4.8	-2.0	-7.3	-3.1	17.2	23.2	-6.1	-24.5
Natural Resources	-22.9	-23.0	3.9	-11.5	-11.5	-10.0	-10.0	48.8	2.9	-13.1
Timberland	-1.2	5.6	15.4	0.0	11.9	-1.5	1.3	24.3	3.4	-1.6
Farmland	26.7	16.0	9.4	0.0	11.9	11.4	1.3	24.3	3.4	-1.6
Commodities	-32.6	-33.7	11.6	-10.1	5.6	2.0	-24.4	7.3	-10.4	132.3
US Equity	-45.9	-37.3	0.2	-16.9	-29.8	-43.1	-1.9	31.5	-6.3	-42.6
Public EAFE Equity	-52.1	-43.4	7.8	-11.5	-14.5	-46.7	-10.7	69.1	-7.0	-42.6
Public EM Equity	-51.2	-53.3	7.8	-26.7	-14.5	-43.9	-10.7	69.1	-7.0	-42.6
Long-Short Equity	-26.4	-26.6	2.6	-8.3	-17.9	-8.8	-1.2	18.9	-3.8	-25.6
Private Equity	-22.1	-19.9	14.6	0.0	2.7	-15.1	-1.4	15.0	-4.4	-29.8
Global Macro/GTAA	7.4	4.8	-4.3	-3.5	-5.4	12.8	9.8	20.9	-4.8	11.1
Hedge Funds (FoF)	-19.5	-21.4	-3.5	-7.7	-16.8	-0.4	-0.3	18.3	-5.4	-23.2
Hedge Funds	-17.8	-19.0	4.1	-9.4	-15.8	-2.1	0.7	19.3	-4.4	-22.2
Cash	2.6	1.6	3.9	0.8	1.4	4.7	13.3	5.9	2.9	13.5
Gold (spot)	23.6	5.8	-1.9	-7.2	8.6	15.9	-32.7	38.7	-3.4	137.5

Stress Test Return Assumptions[1]

	Rates rise 100 bp (%)	Rates rise 200 bp (%)	Rates rise 300 bp (%)	BBB Spreads widen by 50 bp (%)	BBB Spreads widen by 300 bp (%)	USD Gains 10% (%)	USD Gains 20% (%)	Equities Decline 10% (%)	Equities Decline 25% (%)	Equities Decline 40% (%)	Rates fall 100 bp (%)	Rates fall 200 bp (%)
Public Domestic Equity	10.3	9.0	6.9	6.0	-42.0	3.5	7.0	-10.0	-25.0	-40.0	10.5	8.4
Public Foreign Equity (Developed)	10.3	9.0	6.9	5.5	-33.0	-7.0	-14.0	-10.5	-26.3	-42.0	10.5	8.4
Public Foreign Equity (Emerging)	10.3	9.0	6.9	5.0	-39.0	-7.0	-14.0	-11.0	-27.5	-44.0	10.5	8.4
Long-Short Hedge Funds	6.4	7.0	6.0	6.5	-21.0	2.1	4.2	-6.0	-15.0	-24.0	6.3	5.0
Private Equity	5.2	4.5	3.5	6.0	-42.0	3.5	7.0	-8.0	-20.0	-32.0	5.3	4.2
Core Real Estate	8.7	9.6	8.7	9.5	-12.0	4.0	8.0	-5.0	-12.5	-20.0	5.5	5.2
REITs	7.9	8.0	6.0	0.5	-36.0	1.0	2.0	-9.5	-23.8	-38.0	14.9	7.4
Non-Core Real Estate	7.1	10.4	9.3	11.5	-24.0	4.0	8.0	-7.0	-17.5	-28.0	3.6	7.6
Infrastructure (private)	4.3	2.6	2.9	3.5	-24.0	3.0	6.0	-5.0	-12.5	-20.0	5.3	5.5
Natural Resources (private)	8.6	12.2	13.5	2.0	-16.5	-3.1	-6.2	-5.0	-12.5	-20.0	2.5	2.0
Natural Resources (public)	11.4	16.2	18.0	4.0	-33.0	-6.2	-12.3	-9.5	-23.8	-38.0	5.0	4.0
Commodities	8.7	4.6	-0.6	-0.5	-21.0	-15.0	-30.0	-7.0	-17.5	-28.0	1.8	-4.8
Short-Term Bonds	-6.4	-12.2	-17.9	8.0	6.0	7.0	14.0	1.0	2.5	4.0	5.1	10.9
Long-Term Government Bonds	-15.3	-33.6	-52.0	12.0	15.0	10.0	20.0	5.0	12.5	20.0	21.6	40.0
TIPS	-7.0	-15.8	-24.6	8.5	12.0	8.0	16.0	1.0	2.5	4.0	10.6	19.4
Investment Grade Bonds	-3.4	-8.6	-13.9	-0.4	-4.6	8.0	16.0	2.0	5.0	8.0	7.2	12.5
Investment Grade Corporate Bonds	-4.3	-11.4	-18.5	-1.4	-18.5	8.0	16.0	-1.5	-3.8	-6.0	9.9	17.0
Foreign Developed Bonds	-5.1	-11.8	-18.5	0.0	-3.5	-6.3	-12.6	-2.0	-5.0	-8.0	8.4	15.2
Emerging Market Bonds (external)	-2.0	-7.9	-13.9	-2.7	-25.9	5.0	10.0	-2.0	-5.0	-8.0	10.0	16.0
Emerging Market Bonds (local)	-0.8	-6.6	-12.3	1.4	-8.0	-6.3	-12.6	-3.0	-7.5	-12.0	10.7	16.4
High Yield Bonds	1.5	-2.6	-6.7	-4.9	-35.9	4.5	9.0	-6.0	-15.0	-24.0	9.7	13.8
Bank Loans	5.0	6.0	7.5	2.5	-30.0	4.5	9.0	-6.0	-15.0	-24.0	3.0	2.0
Hedge Funds	5.8	6.2	3.6	3.5	-18.0	5.0	10.0	-5.0	-12.5	-20.0	8.1	4.4
TAA	7.8	5.7	3.1	6.5	-22.2	3.2	6.4	-7.0	-17.5	-28.0	10.8	11.8
Risk Parity	6.1	2.1	-2.5	5.6	-12.0	1.6	3.3	-2.0	-5.0	-8.0	10.2	12.3

[1] Assumptions are based on performance for each asset class during historical periods that resembled these situations.

Overview of Annual Asset Study Methodology

- In order to construct an optimal portfolio from a risk-return standpoint, conventional financial wisdom dictates that one develop return, volatility, and correlation expectations over the relevant investing horizon.
- Given the uncertainty surrounding financial and economic forecasts, expectations development is challenging, and any of several methodological approaches may meaningfully contribute to this complex task.
- Meketa Investment Group's process relies on both quantitative and qualitative methodologies.
- First, we employ a large set of quantitative models to arrive at a set of baseline expected ten-year annualized returns for major asset classes.
- These models attempt to forecast a gross "beta" return for each public market asset class; that is, we specifically do not model "alpha," nor do we apply an estimate for management fees or other operational expenses.1
- Our models are fundamentally based (based on some theoretically defined return relationship with current observable factors).
- Some of these models are more predictive than others. For this reason, we next overlay a qualitative analysis, which takes the form of a data-driven deliberation among the research team and our Investment Policy Committee.
- Return assumptions for hard-to-predict asset classes as well as those with limited data will be influenced more heavily by our qualitative analysis.
- As a result of this process, we form our ten-year annualized return expectations, which serve as the primary foundation of our longer-term, twenty year expectations.

[1] Our expectations are net of fees where passive management is not available (e.g., private markets and hedge funds).

Overview of Annual Asset Study Methodology (continued)

- We form our twenty-year annualized return expectations by systematically considering historical returns on an asset class by asset class level. Specifically, we construct a weighted average of our ten-year expectations and average historical returns in each asset class.
- The weights are determined by a qualitative assessment of the value of the historical data. Generally, if we have little confidence that the historical average return is representative of what an investor can expect[1], we will weight our ten-year forecast more heavily. Therefore, the weight on our ten-year forecasts ranges from 0.5 to 0.9.
- We develop our twenty-year volatility and correlation expectations differently. We rely primarily on historical averages, with an emphasis given to the experience of the trailing ten years.
- Qualitative adjustments, when applied, usually serve to increase the correlations and volatility over and above the historical estimates (e.g., using the higher correlations usually observed during a volatile market).
- We also make adjustments to the volatility based on the historical skewness of each asset class (e.g., increasing the volatility for an asset class that has been negatively skewed).
- In the case of private markets and other illiquid asset classes where historical volatility and correlations have been artificially dampened, we seek public market equivalents on which to base our estimates before applying any qualitative adjustments.
- These volatility and correlation expectations are then combined with our twenty-year return expectations to assist us in subsequent asset allocation work, including mean-variance optimization and scenario analyses.

[1] For example, we have less confidence in historical data that do not capture many possible market scenarios or that are overly polluted by survivorship bias.

Meketa Investment Group 2014 Annual Asset Study
Twenty-Year Annualized Return and Volatility Expectations for Major Asset Classes

Asset Class	Annualized Average Return (%)	Annualized Compounded Return (%)	Annualized Standard Deviation (%)
Fixed Income			
Cash Equivalents	2.3	2.3	1.0
Investment Grade Bonds	3.6	3.5	5.0
Long-term Government Bonds	5.1	4.6	12.0
TIPS	4.3	4.1	8.0
High Yield Bonds	6.3	5.8	12.0
Bank Loans	5.3	4.9	9.5
Foreign Bonds (unhedged)	3.4	3.1	9.5
Emerging Market Bonds (local; unhedged)	7.7	7.1	12.5
Emerging Market Bonds (major; unhedged)	5.9	5.5	11.0
Equities			
Public US Equity	9.4	8.2	18.0
Public Developed Market Equity	10.5	9.0	20.0
Public Emerging Market Equity	14.3	12.0	25.0
Private Equity	12.6	10.5	24.0
Long-Short Hedge Funds	5.3	4.8	12.0
Real Assets			
REITs	10.5	7.9	26.5
Core Private Real Estate	7.3	6.7	12.5
Value Added Real Estate	10.0	8.5	20.0
Opportunistic Real Estate	12.7	10.4	25.0
Natural Resources (Private)	10.8	9.2	21.0
Commodities	8.0	6.5	20.0
Infrastructure (Core)	8.4	7.4	16.0
Infrastructure (Non-Core)	11.8	10.0	22.0
Other			
Hedge Funds	6.3	5.8	10.5

Meketa Investment Group 2014 Annual Asset Study

Correlation Expectations for Major Asset Classes

	TIPS	Investment Grade Bonds	High Yield Bonds	Public US Equity	Public Developed Market Equity	Public Emerging Market Equity	Private Equity	Real Estate	Natural Resources (private)	Commodities	Infrastructure (private)	Hedge Funds
TIPS	1.00											
Investment Grade Bonds	0.80	1.00										
High Yield Bonds	0.30	0.20	1.00									
Public US Equity	0.00	0.05	0.70	1.00								
Public Developed Market Equity	0.15	0.05	0.70	0.90	1.00							
Public Emerging Market Equity	0.15	0.05	0.70	0.80	0.90	1.00						
Private Equity	0.05	0.05	0.65	0.85	0.80	0.75	1.00					
Real Estate	0.10	0.20	0.50	0.50	0.45	0.40	0.45	1.00				
Natural Resources (private)	0.10	0.10	0.45	0.65	0.60	0.60	0.55	0.45	1.00			
Commodities	0.35	0.05	0.40	0.35	0.55	0.60	0.30	0.15	0.65	1.00		
Infrastructure (core)	0.30	0.30	0.60	0.55	0.55	0.50	0.45	0.60	0.60	0.35	1.00	
Hedge Funds	0.20	0.05	0.70	0.80	0.85	0.85	0.65	0.45	0.65	0.65	0.60	1.00

Commodities

Asset Class Description

- Commodities consist of raw materials that serve as inputs for many essential products.
- The index consists of roughly three equal parts of energy, metals, and agriculture.
- Futures are the preferred vehicle for investors as physical ownership and storage is costly.

Pros

- Low correlation to traditional equity and fixed income markets.
- Positive correlation with inflation.
- Rising demand from emerging and developed markets.

Cons

- High volatility.
- Risk of declining prices from technological advances.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 2/1/91	Standard Deviation	Sharpe Ratio	Correlation
DJ-UBS Commodity	-9.5	-8.2	1.4	-0.3	3.9	15.6	0.0	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*9.9*	*16.3*	*0.4*	*0.31*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*7.9*	*3.9*	*0.8*	*0.04*

Natural Resources

Asset Class Description

- Companies that harvest, produce, process, refine, transport and market commodities.
- Natural resources include a large array of opportunities in primarily in two categories:
  - Exploration and Production: Oil, natural gas, coal, industrial and precious metals.
  - Environment and Land: Farmland, timberland, water rights, and wetlands.
- Investors can access natural resources mangers through public equities and private markets.

Pros

- Projected continuation of demand growth with a favorable supply/demand imbalance.
- Return on capital invested to bring commodities to market.

Cons

- Political risk is prevalent as some natural resource opportunities are located in unfriendly nations.
- Environmental risks and sensitivity to geopolitical events can become issues.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 12/1/02	Standard Deviation	Sharpe Ratio	Correlation
S&P Global Natural Resources	1.5	-2.5	7.0	9.6	12.5	24.1	0.5	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*8.5*	*15.8*	*0.4*	*0.70*

Private Equity

Asset Class Description

- Private equity represents investments in privately held companies.
- These investments are generally structured as partnerships that consist of ten to twenty equity investments in individual companies.
- Investments come in many forms, including: venture capital, buyouts, mezzanine debt, and special situations.
- Institutional investors can invest in direct funds or via a fund of funds.

Pros:

- Potential for returns in excess of those from public equities.
- Greater potential for (more persistent) alpha.

Cons:

- Often utilize leverage.
- Limited liquidity.
- High fees (management fee plus an incentive fee).

Return History:

As of September 30, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 7/1/84	Standard Deviation	Sharpe Ratio	Correlation
Venture Economics Private Equity composite	18.1	14.8	10.3	13.2	12.3	14.9	0.5	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*11.5*	*17.3*	*0.4*	*0.07*

Real Estate

Asset Class Description

- Core real estate represents high-quality, income-producing properties with stable cash flows.
- The most common property types are: office, industrial (warehouse), retail (malls, shopping centers), and residential (apartments, condominiums).
- Institutional investors can invest via public markets (REITs) or private markets.

Pros:

- Core properties produce stable income.
- Low correlation to traditional equity and bond markets.

Cons:

- Historically, returns have been cyclical and linked to the performance of the broad economy.
- During periods of large net redemptions, liquidity may dry up.

Return History:

As of September 30, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 4/30/94	Since 1/1/78	Standard Deviation	Sharpe Ratio	Correlation w/ NCREIF	Correlation w/ NAREIT
NCREIF Property	11.0	12.0	5.7	8.7	9.4	9.2	6.5	1.0	1.00	-0.02
NAREIT Equity	2.9	10.1	16.9	8.6	10.3	NA	22.7	0.3	-0.02	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*9.6*	*11.8*	*16.8*	*0.4*	*-0.05*	*0.56*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*6.0*	*7.8*	*3.8*	*0.8*	*-0.09*	*0.14*

Hedge Funds

Asset Class Description

- General term used to describe a broad array of strategies.
- Private investment vehicles that can invest in any asset class (i.e., no specific benchmark).
- Can utilize many investment tools including short selling, leverage, and derivatives to execute the chosen strategy.
- Institutional investors can invest in direct funds or via a fund of hedge funds.

Pros:

- Potential for equity like returns with bond like volatility.
- Some strategies have historically exhibited low correlation to traditional equity and bond markets.

Cons:

- Often utilize leverage.
- Limited transparency and complex strategies require extensive oversight.
- High fees (management fee plus an incentive fee).

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 1/1/90	Standard Deviation	Sharpe Ratio	Correlation
HFRI Fund-Weighted composite	9.1	3.2	7.8	5.7	10.9	7.6	1.0	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*9.5*	*16.4*	*0.4*	*0.74*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*6.5*	*3.9*	*0.8*	*0.08*

TIPS

Asset Class Description

- TIPS are inflation-linked bonds issued by the US Treasury.
- They were first issued in 1997, and they are most often issued in maturities of 5, 10, and 30 years.
- The coupon is applied against the principal, which grows at the rate of inflation (i.e., the CPI-U).

Pros:

- Backed by the US Treasury.
- Negatively correlated with equities.
- Prices rise when higher inflation is perceived.

Cons:

- Less liquid than Treasuries, but much more liquid than corporate bonds.
- Historically more volatile than Treasuries.
- Will underperform during periods of perceived deflation.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 3/1/97	Standard Deviation	Sharpe Ratio	Correlation
Barclays US TIPS	-6.2	4.2	5.7	4.9	6.2	6.2	0.6	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*6.9*	*17.3*	*0.3*	*0.02*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*5.8*	*3.7*	*0.9*	*0.75*

Emerging Markets Debt

Asset Class Description

- Debt issued by governments of and corporations based in emerging markets.
- While originally dominated by US-dollar issues, most (80%) are now issued in local currencies.

Pros:

- Higher yield than US government bonds.
- Only moderate correlation to US equity and bond markets.
- Significantly improved creditworthiness over the past decade.

Cons:

- Potential for currency to move against US investors.
- High default risk historically and lower liquidity than US government bonds.
- Event and political risks.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 1/1/94	Standard Deviation	Sharpe Ratio	Correlation
JPM EM Bond Index - Global Diversified	-5.3	6.1	11.7	8.2	9.8	13.9	0.5	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*9.2*	*16.8*	*0.4*	*0.53*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*5.7*	*3.9*	*0.7*	*0.38*

High Yield Bonds

Asset Class Description

- Bonds that are rated as less than investment grade by the credit-rating agencies (e.g., S&P, Moody's).
- During the 1980's, original issue high yield debt started to gain respectability, but also developed reputation as "junk bonds."

Pros:

- Provide higher income than that available from traditional bonds.
- High yield bonds have produced outsized gains during economic rebounds.

Cons:

- The risk of default is the primary risk.
- Liquidity risk, though muted, still exists.
- Returns are highly tied to the economic (especially the credit) cycle.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 7/1/83	Standard Deviation	Sharpe Ratio	Correlation
Barclays US High Yield	7.4	9.3	19.0	8.6	9.5	9.4	0.6	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*10.9*	*17.0*	*0.4*	*0.58*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*7.7*	*4.7*	*0.7*	*0.29*

Bank Loans

Asset Class Description

- Bank loans are senior floating-rate loans made to corporations, usually made by a syndicate of banks.
- These loans are typically used by firms to fund everything from working capital needs to acquisitions.
- Companies have historically used leverage loans to access capital cheaper than by issuing high yield bonds.
- Though the loans were originated by banks, most trade freely in a secondary market.

Pros:

- Provide higher income than that available from traditional bonds.
- More senior position in the capital structure implies less risk than for high yield bonds.
- Floating-rate feature can provide a hedge against rising interest rates.

Cons:

- The risk of default is the primary risk.
- Liquidity risk is higher than for high yield bonds.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 1/1/92	Standard Deviation	Sharpe Ratio	Correlation
CSFB Leveraged Loan	6.2	5.8	13.5	5.1	6.0	5.6	0.5	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*9.2*	*16.1*	*0.4*	*0.42*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*6.0*	*3.9*	*0.8*	*-0.03*

Infrastructure

Asset Class Description

- The underlying foundation of basic services, facilities, and institutions upon which a community depends.
- Investable infrastructure includes the development and/or ownership of:
  - Transportation - roads, bridges, airports
  - Environmental – water, waste, sanitation
  - Energy – pipelines, power generation and distribution
  - Communication - cable, internet, phone networks
  - Social - hospitals, schools, parks
- This is a relatively new asset class to US investors, but it has a longer history in Europe, Canada, and Australia.
- Investors can access infrastructure through public and private markets.

Pros

- Equity-like returns.
- Provides a hedge against inflation.
- Low correlation to other asset classes.

Cons

- Public to private assets may be subject to political pressures in some areas.
- Private market structures are illiquid and can use leverage.

Foreign Small Cap

Asset Class Description

- Foreign small caps are the smaller stocks in the developed overseas markets (i.e., the EAFE countries).
  - Their market cap is usually below $5 billion.

Pros:

- Foreign small capitalization stocks have outperformed foreign large capitalization stocks, perhaps benefitting from the same "small stock effect" as in the US.
- The large investable universe broadens a plan sponsor's investment opportunities.
- Limited analyst coverage creates a relatively inefficient area of the market where alpha can be generated.

Cons:

- Correlations with US markets have risen substantially since the late 1990s.
- Volatility will likely be higher than for US stocks.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 1/1/76	Standard Deviation	Sharpe Ratio	Correlation
MSCI EAFE Small Cap/IIA Small Cap	29.3	9.3	18.5	9.5	11.8	17.7	0.4	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*11.4*	*17.0*	*0.4*	*0.59*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*4.6*	*5.9*	*0.5*	*0.15*

Emerging Markets

Asset Class Description

- Emerging markets are not easily defined, but typically encompass countries with low per capita income.
- Emerging markets comprise roughly 80% of the world's population and 37% of global economic output.
- The B.R.I.C. (Brazil, Russia, India, and China) countries are bellwethers of the emerging markets.

Pros

- Rationale behind investing in emerging markets is simple: growth.
  - Lower starting point, less debt burden, more favorable demographics.
- Expect higher returns than for developed markets.

Cons

- Greater volatility.
- Greater event and political risks.
- Despite improved liquidity, costs remain high.

Return History:

As of December 31, 2013	1-Year Return	3-Year Return	5-Year Return	10-Year Return	Since 1/1/88	Standard Deviation	Sharpe Ratio	Correlation
MSCI Emerging Markets	-2.6	-2.1	14.8	11.2	11.9	27.3	0.3	1.00
S&P 500	*32.4*	*16.2*	*17.9*	*7.4*	*10.5*	*16.3*	*0.4*	*0.67*
Barclays Aggregate	*-2.0*	*3.3*	*4.4*	*4.5*	*6.9*	*4.1*	*0.8*	*0.02*

Investment Terminology Glossary

Active Management: A style of investment management that seeks to attain above-average risk-adjusted performance. The pursuit of investment returns in excess of a specified benchmark by creating portfolios that differ from the benchmark. When these investments are successful, active management produces returns that are superior to a passive benchmark (indexes). The failure of these investments to achieve the objectives represents an active management risk.

Alpha: A measure of a portfolio's actual return relative to its benchmark. Specifically, in the case of investment managers, alpha estimates the value added by a manager due to skill rather than luck (or randomness). A positive alpha indicates that a manager outperformed the benchmark, while a negative alpha indicates underperformance.

Beta: Refers to a measure of the systematic, non-diversifiable risk of an investment. Specifically, beta measures the volatility of an investment (e.g., a manager's portfolio) relative to the market, which is defined as the manager's benchmark. A beta above 1.0 is more volatile than the benchmark, while a beta below 1.0 is less volatile.

Correlation: A measure of the degree to which two variables move together. The correlation can range between 1.0 (perfectly positively correlated) and –1.0 (perfectly inversely correlated). A negative correlation indicates an inverse relationship, whereas a positive value indicates a direct or positive relationship. Squaring the correlation coefficient produces a value (R2) that indicates how much of a change in one variable (e.g., a manager's portfolio) is explained by a change in another (e.g., the benchmark).

Coupon Rate: The interest rate stated on the face of a bond, note or other fixed income security expressed as percentage of the face value (principal).

Credit Risk: Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security.)

Duration: Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

Emerging Markets: Emerging Markets funds invest in securities of companies or the sovereign debt of developing or "emerging" countries. "Emerging Markets" include countries in Latin America, Eastern Europe, the former Soviet Union, Africa, and parts of Asia. Emerging Markets - Global funds will shift their weightings among these regions according to market conditions and manager perspectives. In addition, some managers invest solely in individual regions.

Equities: Refers to ownership of property, usually in the form of common stocks, as distinguished from fixed income-bearing securities, such as bonds or mortgages.

Expense Ratio: A statistical way of evaluating how efficiently a mutual fund is operating. It is derived by dividing a fund's operating expenses by its net asset value.

Fixed Income: Income that remains constant and does not fluctuate, such as income derived from bonds, annuities, preferred stock and royalties.

Information Ratio: This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

Interest rate risk: The chance that a security's value will change due to a change in interest rates. For example, a bond's price drops as interest rates rise.

Internal rate of return (IRR): Dollar-weighted rate of return. Discount rate at which net present value (NPV) of an investment is zero. The rate at which a bond's future cash flows, discounted back to today, equal its price.

Market Capitalization: For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

Market Weighted: Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

Maturity: The date on which a loan, bond, mortgage or other debt/security becomes due and is to be paid off.

Passive Management/Indexing: A style of investment management that seeks to attain average risk-adjusted performance. The construction of a portfolio of stocks or bonds designed to track the total return performance of an index.

Prepayment Risk: The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

Price-Book Value (P/B) Ratio: The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

Price-Earnings (P/E) Ratio: A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about is future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

Real Estate Investment Trusts (REITs): Companies that invest in income-producing real estate such as apartments, shipping centers and office buildings. Investors can own a fractional interest in these companies by purchasing REIT shares on the major stock exchanges. REITs are required to distribute (or pass through) 90% of their income in the form of dividends**.**

Quality Rating: The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the

event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

Sharpe Ratio: A commonly used measure of risk-adjustment return. It is calculated by subtracting the risk free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

Standard Deviation: A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

STIF Account: Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

Style: The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

Tactical Asset Allocation: Portfolio strategy that allows active departures from the normal asset mix according to specified objective measures of value. Often called active management. It involves forecasting asset returns, volatilities, and correlations. The forecasted variables may be functions of fundamental variables, economic variables, or even technical variables.

Tracking Error: Tracking error measures the amount by which the performance of the manager typically differs from that of the benchmark. Tracking error is calculated as the standard deviation of the difference in returns between the manager and the benchmark.

Tranche: A class of maturity. For example, a collateralized mortgage obligation (CMO) is a debt security backed by a pool of mortgages divided into separate issues of differing maturities with each issue called a tranche.

Treasury Inflation-Protected Securities (TIPS): U.S. Treasury securities that adjust in value based upon changes in the inflation rate as measured by the consumer price index (CPI). They mature in two to 30 years and pay a fixed rate semiannually. Taxes must be paid yearly on the increased value of the bonds.

Turnover: The rate at which securities within a portfolio are exchanged for other securities.

Yield to Maturity: The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a "basis book." For example, a 5% bond pays $5 a year interest on each $100 par value. To figure its current yield, divide $5 by $95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay $100 for the bond that can be bought now for $95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{\text{5\% (discount)}}{\text{5 (yrs. to maturity)}} = \text{1\% pro rata, plus 5.26\% (current yield)} = \text{6.26\% (yield to maturity)}$$

Sources: Investment Terminology, International Foundation of Employee Benefit Plans, 1999.
The Handbook of Fixed Income Securities, Fabozzi, Frank J., 1991.
Hypertextual Finance Glossary, Harvey, Campbell R. 2009