Investment Process

Mission Statement
What’s Allowed/What’s Expected
Provides Direction

Public Equity
Core Fixed Income
Real Estate
Private Markets
Absolute Return
Real Assets
High Yield FI
Cash/Overlay

Relevance
Diversification
Timing
Stability

Evaluation Process
Qualifications
Quantitative
Qualitative
Collaborative

Track Record
People
Strategy/Edge
Terms/Conditions

Industry Network
Experience
Proactive Sourcing
Flexible
Collaborative

Supports Asset Allocation
Number of Managers/GPs
Degree of Specialization
Strategy/Geography

OBJECTIVES
POLICIES
GUIDELINES

ASSET
ALLOCATION/
STRATEGY TYPES

BENCHMARKS

MANAGER
EVALUATION

DOCUMENTATION

ONGOING
EVALUATION

MANAGER
SOURCING

MANAGER
STRUCTURE

vs Objectives
Risk Analysis
Meetings
Fund Management Framework

Manager Selection (5%-10%)

Manager Structure (10%-15%)
Style/Cap Tilts/Active/Passive

Asset Allocation (80%-90%)
Target Policy Mix

*Asset Allocation* is the primary driver of investment results.
Typical Endowment Objectives

- Maintain Purchasing Power of Corpus
- Maximize Distributions
- Limit Distribution Volatility
- Limitation

- While these objectives may be achievable over a long time period (30+ years), none of them recognizes the market’s risk characteristics (i.e., they all may be impossible to meet in a protracted bear market).
Possible Objectives

- What is HIED Trying to Achieve?
  - Maintain/Grow Purchasing Power of Corpus
  - Stable Distributions

- What is HIED Trying to Avoid?
  - Lose of Corpus Purchasing Power
  - Large Changes in Distribution Over Short-Term

- What Are “Unacceptable Outcomes”? 
  - Value of Corpus?
  - Distribution Level?
  - Changes in Distribution Level?
Integrating Asset and Spending Forecasts

- Spending projections are integrated with range of asset projections (5th to 95th percentile) each year via Monte Carlo* simulations (5000 scenarios per year).
- Review 99th percentile outcomes to preview “2008” experience.
- Model estimates asset valuation at start of each new year and distributions for the year based on spending rules.
- Decision Making.
- Project future financial condition under range of policy portfolios over five (base case) and seven (supplemental) years.
- Focus on Ultimate Real Spending Power (Real Value of Cumulative Distributions plus Real Value of Assets).
- Trade off gains (higher Ultimate Real Spending Power) at median versus shortfalls (lower Ultimate Real Spending Power) at 95th (worst 1 in 20) percentile.

* See Appendix for Glossary of Terms
Asset/Liability Modeling

- **Asset Simulations**
  - Monte Carlo – 5000 “Random” Investment Outcomes Per Year

- **Simulations/Distribution Determinations**
  - Based on Range of Investment Results
  - Annual Valuation for Range of Outcomes
  - Year-by-Year, NOT Straight-Line Projection
Asset Allocation: Risk Management

Asset Allocation Policy Addresses Three Primary Risks:

- **Asset Shortfall Risk** (liquid assets insufficient to meet current obligations)
- **Interest Rate Risk** (changes in spending related to change in interest rates)
- **Inflation Risk** (changes in spending related to changes in inflation)

**Goal:** To simultaneously hedge these risks, given investment opportunity set and resources available to the sponsor.

- A Written Investment Policy Documents a Strategy to Address These Risks.

**Goal:** To mitigate the greatest risk all investors face: Human Nature Risk, the risk you will abandon a very well conceived strategy at its least comfortable moment.
Investment Policy Today

- Current Investment Climate
  - Huge deterioration in asset levels – recent rally, some relief
  - Volatile capital markets – recent global “crisis of trust” has passed
  - Illiquidity challenges still prevalent – “deleveraging — risk repricing”
  - More stringent regulatory environment likely

- Key Elements to Investment Policy:
  - Establish strategic (long-term) asset allocation targets and investment guidelines
  - Develop tactical (short-term) strategy to consider market environment and take advantage of available opportunities
  - Continued monitoring and evaluation
  - Disciplined but intelligent approach to rebalancing
Asset Allocation: Role in Hedging Risks

INVESTMENT SHORTFALL RISK
- Global Public Equities (Capital Growth)
- Global Private Equities (Capital Growth)
- Absolute Return (Capital Preservation)
- Cash Equivalents (Capital Preservation & Liquidity)

DISTRESSED CREDIT:
- Private Placements
- High Yield Bonds
- Bank Loans
- RMBS/CMBS

REAL ASSETS:
- Real Estate
- Infrastructure (some)
- Natural Resources
- Commodities
- Timber/Ag

INTEREST RATE RISK
- Nominal Bonds
  - Treasuries/Agencies
  - Mortgage-Backed
  - Asset-Backed
  - Inv Grade Credit
  - Non-Dollar
- Long-Duration Bonds
  - Inv Grade Credit
- Overlay Strategies/Swaps

INFLATION RISK
- Real Return Bonds
  - TIPS
  - ILBs
- Infrastructure (some)
- Long-Duration Bonds
  - Government

NOMINAL BONDS:
- Treasuries/Agencies
- Mortgage-Backed
- Asset-Backed
- Inv Grade Credit
- Non-Dollar
To accomplish our conflicting goals of high return and low risk we must have exposure to assets/portfolios that we expect to generate returns above our target return and assets/portfolios that reduce risk through diversification.
“Asset-Only Space” Allocation Strategy

- The **Return Enhancement** portfolios allow us to create wealth by maximizing total return. These must have expected returns that meet or exceed the Total Fund return objective.
  - Public Equity
  - Private Equity
  - Opportunistic Real Estate
  - High Yield / Distressed Debt

- The Risk Reduction portfolios allow us to **preserve wealth** during weak market conditions. These must have expected returns with a relatively **low or negative correlation** with the Return Enhancement portfolios.
  - Core Fixed Income
  - Core Real Estate
  - Absolute Return Strategies
  - Cash Equivalents

- **Problem:** Asset Only optimization only deals explicitly with the first of these three risks (Investment Shortfall Risk). We also need to capture the Interest Rate and Inflation Risks imbedded in the liabilities.
Asset Mix Optimization*

- **Three Inputs (In Order of Importance)**
  - Return (Geometric*; Annual Growth Rate)
  - Risk (Standard Deviation Around Expectation)
  - Correlation (Degree to Which Assets Move Together)

- **Determining Inputs**
  - How Are You Going to Use Them? Tactically or Strategically?
  - Extrapolate Trends, Mean Reversion* or Full History?

- **Output**
  - Certain Assets Are Difficult to Price and Model in Mean Variance Optimization
  - Efficient Frontier* — Lowest Level of Risk Per Unit of Return; Highest Available Return Per Unit of Risk

* See Appendix for Glossary of Terms
SIS Capital Market Assumptions

- Strategic Purpose - Horizon = 2 to 3 Market Cycles
- Based on Capital Asset Pricing Model (CAPM*) — Investor Must Be Compensated for Taking Higher Risk
- Economic Growth Forecasts
- Stay Within Long-Term Real Return Corridors, Combined with Mean Reversion*
- Qualitative Overlay — Expectations Must Produce Reasonable Portfolios and a “Stable Frontier”
- Data Sources/Return
  - Complete Monthly Return History
  - Blue Chip Economic Forecast (Inflation, GDP Growth Estimates)
  - Wall Street Forecasts
  - Global Manager Forecasts
  - CAPM (For “Difficult” Asset Classes)
- Correlations* — Most Stable (90-Month Half-Life, 1985 to Present)
- Risks — Fairly Stable (Two Factor Model*; Historical 1976 to present, Half-Life 1985 to Present)

* See Appendix for Glossary of Terms
# Asset Class Assumptions

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Expected Return</th>
<th>Expected Risk</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Equity</td>
<td>9.0%</td>
<td>17.2%</td>
<td>0.35</td>
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<tr>
<td>Fixed Income</td>
<td>4.0%</td>
<td>4.5%</td>
<td>0.33</td>
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<tr>
<td>Private Equity</td>
<td>11.0%</td>
<td>35.0%</td>
<td>0.23</td>
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<tr>
<td>Real Assets</td>
<td>7.1%</td>
<td>14.0%</td>
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<td>TIPS</td>
<td>4.0%</td>
<td>5.0%</td>
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## Asset Class Optimization – Real Assets using TIPS

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Mix 1-1</th>
<th>Mix 2-1</th>
<th>Mix 3-1</th>
<th>Mix 4-1</th>
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<tbody>
<tr>
<td>Public Equity</td>
<td>60.0%</td>
<td>52.7%</td>
<td>54.9%</td>
<td>57.0%</td>
<td>58.9%</td>
<td>60.9%</td>
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<tr>
<td>Private Equity</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.5%</td>
<td>11.0%</td>
<td>11.6%</td>
<td>12.2%</td>
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<tr>
<td>Fixed Income</td>
<td>30.0%</td>
<td>11.1%</td>
<td>8.3%</td>
<td>8.3%</td>
<td>5.7%</td>
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<tr>
<td>TIPS</td>
<td>0.0%</td>
<td>26.1%</td>
<td>26.3%</td>
<td>23.7%</td>
<td>23.8%</td>
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<tr>
<td>% Equity</td>
<td>70.0%</td>
<td>62.7%</td>
<td>65.4%</td>
<td>68.0%</td>
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<td>Expected Return</td>
<td>8.31%</td>
<td>8.00%</td>
<td>8.14%</td>
<td>8.28%</td>
<td>8.41%</td>
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<td>Exp. Std. Dev.</td>
<td>13.3%</td>
<td>12.1%</td>
<td>12.6%</td>
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<td>0.413</td>
<td>0.408</td>
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### Asset Class Optimization – Incorporating More Difficult Real Assets

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<th>Mix 1-2</th>
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<th>Mix 4-2</th>
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<tr>
<td>Public Equity</td>
<td>60.0%</td>
<td>42.7%</td>
<td>46.7%</td>
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<td>Private Equity</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.1%</td>
<td>10.8%</td>
<td>11.8%</td>
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<tr>
<td>Fixed Income</td>
<td>30.0%</td>
<td>32.3%</td>
<td>28.3%</td>
<td>24.4%</td>
<td>21.1%</td>
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<tr>
<td>Real Assets</td>
<td>0.0%</td>
<td>15.0%</td>
<td>15.0%</td>
<td>15.0%</td>
<td>15.0%</td>
<td>15.0%</td>
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<thead>
<tr>
<th></th>
<th>% Equity</th>
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</thead>
<tbody>
<tr>
<td>% Equity</td>
<td>70.0%</td>
<td>60.2%</td>
<td>64.2%</td>
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<td>71.4%</td>
<td>74.6%</td>
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<table>
<thead>
<tr>
<th></th>
<th>Expected Return</th>
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<tr>
<td>Expected Return</td>
<td>8.31%</td>
<td>8.00%</td>
<td>8.18%</td>
<td>8.35%</td>
<td>8.53%</td>
<td>8.71%</td>
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<td>Exp. Std. Dev.</td>
<td>13.3%</td>
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<td>12.8%</td>
<td>13.4%</td>
<td>14.0%</td>
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<tr>
<td>Sharpe Ratio</td>
<td>0.401</td>
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<td>0.425</td>
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<td>0.414</td>
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### Asset Mix Comparison with other Oregon University Endowments

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<tr>
<th></th>
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<th>U of O</th>
<th>OSU</th>
<th>Mix 3-1</th>
<th>Mix 3-2</th>
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<tbody>
<tr>
<td><strong>Public Equity</strong></td>
<td>60.0%</td>
<td>30.0%</td>
<td>40.0%</td>
<td>57.0%</td>
<td>50.5%</td>
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<tr>
<td><strong>Private Equity</strong></td>
<td>10.0%</td>
<td>20.0%</td>
<td>6.0%</td>
<td>11.0%</td>
<td>10.1%</td>
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<tr>
<td><strong>Fixed Income</strong></td>
<td>30.0%</td>
<td>10.0%</td>
<td>17.0%</td>
<td>8.3%</td>
<td>24.4%</td>
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<tr>
<td><strong>Real Assets</strong></td>
<td>0.0%</td>
<td>15.0%</td>
<td>17.0%</td>
<td>23.7%</td>
<td>15.0%</td>
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<tr>
<td><strong>Absolute Return</strong></td>
<td>0.0%</td>
<td>25.0%</td>
<td>20.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td><strong>% Equity</strong></td>
<td>70.0%</td>
<td>85.0%</td>
<td>78.0%</td>
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<td>68.1%</td>
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<tr>
<td><strong>Expected Return</strong></td>
<td>8.31%</td>
<td>8.72%</td>
<td>7.92%</td>
<td>8.28%</td>
<td>8.35%</td>
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<tr>
<td><strong>Exp. Std. Dev.</strong></td>
<td>13.3%</td>
<td>14.7%</td>
<td>11.5%</td>
<td>13.1%</td>
<td>12.8%</td>
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<tr>
<td><strong>Sharpe Ratio</strong></td>
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<td>0.390</td>
<td>0.426</td>
<td>0.404</td>
<td>0.420</td>
</tr>
</tbody>
</table>
Efficient Frontiers*

* See Appendix for Glossary of Terms
Eight Decades of Wealth Indices

Total Return

2000's

Small Cap 3.8%
Large Cap 0.9%
Intermediate 3.0%
U.S. T-Bills 2.7%
Data Through December 2009

1990's

Small Cap 13.4%
Large Cap 16.3%
Intermediate 7.1%
U.S. T-Bills 4.9%

1800's

Small Cap 14.5%
Large Cap 17.5%
Intermediate 11.7%
U.S. T-Bills 8.7%

1970's

Small Cap 11.3%
Large Cap 5.9%
Intermediate 0.9%
U.S. T-Bills 6.3%

1960's

Small Cap 15.5%
Large Cap 7.8%
Intermediate 3.7%
U.S. T-Bills 3.9%

1950's

Small Cap 16.5%
Large Cap 15.4%
Intermediate 1.7%
U.S. T-Bills 1.9%

1940's

Small Cap 20.7%
Large Cap 9.2%
Intermediate 1.8%
U.S. T-Bills 0.1%

1930's

Small Cap 14.4%
Large Cap 4.0%
Intermediate 0.6%
U.S. T-Bills 0.6%

Log Scale

All Decades

Log Scale

Data is expressed as a Compound Annual Rate.

The graphs assume $1.00 is invested December 31st of the year prior to the beginning of the decade.

Sources: Standard & Poor's Corporation; Russell Investment Group; Ryan Labs, Inc.; Barclays Capital Financial Analysts Research Foundation; © 2010 Crandall, Pierce & Company - All rights reserved.

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The information presented herein was compiled from sources believed to be reliable. It is intended for illustrative purposes only, and is furnished without responsibility for completeness or accuracy. Past performance does not guarantee future results.
Dollar Size of Potential New Allocations

- Assume 15% Allocation
  - TIPS - $9.5 million
  - Diversified Real Assets
    - TIPS – $3.2 million
    - Real Estate - $3.2 million
    - Commodities/Hard Assets - $3.2 million
- Non-TIPS allocations would likely require an expensive fund-of-funds approach
Next Steps

- Alternative 1
  - Adopt TIPS/Real Assets Allocation Funded from Fixed Income
    - Maintain Current Public and Private Equity Policy Allocations
  - Investigate Incorporating other Real Assets into Allocation over time
  - Maintain current spending policy

- Alternative 2
  - Full Asset/Spending Analysis
  - Investigate full range of spending and asset mix policies
Glossary of Terms

- **Asset Allocation** – (1) The way investments are distributed and weighted among different asset classes. (2) The distribution of investments among categories of assets, such as equities, fixed income, cash equivalents, and real estate.

- **CAPM** – Capital Asset Pricing Model. A system of equations that describes the way prices of individual assets are determined in efficient markets, that is, in markets where information is freely available and reflected instantaneously in asset prices. According to this model, prices are determined in such a way that risk premiums are proportional to systematic risk, measured by the beta coefficient, which cannot be eliminated by diversification. CAPM provides an explicit expression of the expected returns for all assets. Basically, the model holds that if investors are risk averse, high-risk stocks must have higher expected returns than low-risk stocks. CAPM maintains that the expected return of a security or a portfolio is equal to the rate on a risk-free investment plus a risk premium.

- **Correlation** – A relationship between two quantities, such that when one changes, the other does. A measure (ranging in value from 1.00 to -1.00) of the association between a dependent variable (fund, portfolio) and one or more independent variables (index). Correlation is a measure, not necessarily of causality, but rather of the strength of a relationship. A correlation coefficient of 1.00 implies that the variables move perfectly in lockstep; a correlation coefficient of -1.00 implies that they move inversely in lockstep; and a coefficient of 0.00 implies that the variables as calibrated are uncorrelated.

- **Efficient Frontier** – A set of optimal portfolios, one for each level of expected return, with minimum risk.

- **Expected Return** – Estimate of the return of an investment or portfolio from a probability distribution curve of all possible rates of return; statistically, it is the mean (either geometric mean or arithmetic mean) of the distribution or the "most likely" outcome.

- **Factor Model** – Regression-based mathematical calculation used to determine the extent to which macroeconomic factors or other explanatory variables affect the value or price movement of a specific security or portfolio.
Glossary of Terms

- **Geometric Return** – Similar to the arithmetic mean, which is what most people think of with the word "average", except that instead of adding the set of returns and then dividing the sum by the number of return observations (N), the numbers are multiplied and then the Nth root of the resulting product is taken. Also known as compound return.

- **Mean Reversion** – Statistical phenomenon stating that the greater the deviation of a given observation (e.g. a quarterly or annual return) from its mean, the greater the probability that the next measured observation will deviate less far. In other words, an extreme event is likely to be followed by a less extreme event.

- **Monte Carlo Simulation** – Uses stochastic processes to simulate the various sources of uncertainty that affect the value of the instrument, portfolio or investment in question, and calculates a representative value or distribution of possible outcomes given the simulated values of the underlying inputs.

- **Optimization** – Process of determining the portfolio composition such that expected return is maximized for a given risk level, or risk is minimized for a given expected return level. Other optimizations could target risk of shortfall, maximization of Sharpe ratio, or minimization of tracking error.

- **Sharpe Ratio** – A ratio of return to volatility, useful in comparing two portfolios or stocks in terms of risk-adjusted return. The higher the Sharpe Ratio, the more sufficient are returns for each unit of risk. It is calculated by first subtracting the risk free rate from the return of the portfolio, then dividing by the standard deviation of the portfolio.

- **Treasury Inflation-Protected Securities (TIPS)** – Inflation-indexed bonds issued by the U.S. Treasury. The principal is adjusted to the Consumer Price Index (CPI), the commonly used measure of inflation. The coupon rate is constant, but generates a different amount of interest when multiplied by the inflation-adjusted principal, thus protecting the holder against inflation. TIPS are currently offered in 5-year, 10-year and 20-year maturities. Beginning in February 2010, the U.S. Treasury will once again offer 30-year TIPS bonds.
Professional Biographies

- **MICHAEL R. BEASLEY, Managing Director.** Co-founded Strategic Investment Solutions, Inc. (SIS) with Barry Dennis in 1994. Former EVP and Head of Consulting of Callan Associates, which he joined in 1986 and left in 1993. Founded Callan’s Atlanta Office in 1986 and concurrently managed its New York Office in 1988. Served as Chairman of Callan’s Manager Search Committee for two years. Brings 30 years of consulting and institutional investment experience to SIS. Prior experience includes 13 years with Merrill Lynch’s Capital Markets Group in Jacksonville and Atlanta. Former Editorial Board member of the *Journal of Pension Plan Investing*. Frequent speaker on institutional investment issues. Graduate of the New Mexico Military Institute and an officer of the U.S. Army for five years that included a combat tour of duty in Vietnam.

- **JOHN P. MEIER, CFA, Managing Director and Head of Quantitative Services.** Highly experienced specialist in strategic planning, capital markets analysis, and quantitative investment strategies. A leading authority in the fields of performance benchmarking and portfolio performance attribution, whose ideas have been published in *Pensions and Investments, Futures, Risk and Quantitative International Investing*. Senior Product Manager at BARRA from 1988 to 1994, responsible for equity risk and valuation models and services. B.S. in Chem. Eng. From Michigan State, MBA in Finance from UC Berkeley.

- **MARC GESELL, CFA, Vice President.** Quantitative analysis, statistical research, and systems development specialist responsible for strategic planning. Seven years experience in software R&D, asset allocation modeling, and investment analysis. Most recently AVP and portfolio manager for First Interstate Bank (now Wells Fargo), responsible for managing $200 million in private client portfolios. Helped establish clients’ strategic plans, investment objectives, asset allocation mixes, and portfolio structure. B.S. in Computational Mathematics, Arizona State University, MBA in Finance, San Francisco State University, Chartered Financial Analyst. Former Officer, United State Army.

- **LOUIS KINGSLAND, JR., Adviser and Chair, Investment Policy Committee.** Developed first commercially available asset allocation and liability simulation model and asset mix optimizer, both still widely used today. Most recently EVP of Mellon Capital Management. Graduate, Air Force Academy. MA in Engineering, CalTech. Served as Deputy Mission Director of The Viking Space Project, and received a Distinguished Service Medal from NASA.
Defining Risk

- The basic definition of investment risk is variability of return. The alternative policies, or “asset mixes,” examined here are built to minimize this variability given an expected level of return over a long period of time. These mixes we call efficient. The method used to build them is an improved version of standard mean-variance optimization. The probabilities of continuously compounded returns to each asset class are assumed to approximate a bell shaped curve, or normal distribution. In other words, returns are random, and returns near the expected average are more likely than extreme returns. The likelihood of extreme returns is expressed as standard deviation. The probability of a particular asset-class return depends on the returns provided by every other asset class; this interdependence is expressed as correlation. Thus asset-class return expectations are commonly presented as three sets of numbers: mean returns, standard deviations, and correlations.
# SIS Capital Markets Expectation Methodology

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Methodology</th>
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</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>Yield to Worst on Aggregate Index (compare to historic bond risk premium); adjusted for OPERF’s duration target and unique sector allocations</td>
</tr>
<tr>
<td>Inflation</td>
<td>Consensus of economists’ forecasts, TIPS</td>
</tr>
<tr>
<td>US Large Cap</td>
<td>CAPM, 3% to 6% equity premium, macroeconomic DDM</td>
</tr>
<tr>
<td>Cash</td>
<td>Inflation + 1% to 2% premium</td>
</tr>
<tr>
<td>US Small Cap</td>
<td>CAPM, (beta of ~1.2)</td>
</tr>
<tr>
<td>Private Equity</td>
<td>CAPM, (beta of ~1.6); adjusted for OPERF</td>
</tr>
<tr>
<td>International Equity</td>
<td>Weighted sum of local market premium + local risk free rate; composition is World ex-US</td>
</tr>
<tr>
<td>Emerging Mkt Equity</td>
<td>Weighted sum of local market premium + local risk free rate; composition is Emerging Markets</td>
</tr>
<tr>
<td>Real Estate</td>
<td>Historical behavior of equity REITs; current appraisal cap rates; CAPM; adjusted for OPERF’s leverage policy</td>
</tr>
<tr>
<td>Absolute Return</td>
<td>Expected net premium to LIBOR (2-4%); 0.30 Sharpe Ratio</td>
</tr>
<tr>
<td>High Yield FI</td>
<td>Historical ratio: spread of High Yield over US Fixed Income divided by spread of Large Cap over US Fixed Income</td>
</tr>
<tr>
<td>TIPs*</td>
<td>Current real yield on Barclay’s US TIPs Index plus SIS inflation expectation</td>
</tr>
</tbody>
</table>

* See Appendix for Glossary of Terms
# SIS Capital Market Expectations (10/30/2009)

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<td>US Lrg Cap</td>
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History of Key Relationships

Expected Risk Premiums

- Expected Equity Risk Premium (US Large Cap Return - US Fixed Income Return)
- Expected Non-US Equity Risk Premium (Non-US Equity Return - US Equity Return)
Expected Returns

Geometric Mean Future Return

- US Large Cap
- US Small Cap
- US Bonds
- Intl Dev Mkt Stock
- Emg Mkt Stock
- Dev Mkt Bonds
- Private Mkts
- Real Estate
- US Estate
- US High Yield
- Emg Mkt Bonds
- TIPS
- Cash
- US Inflation