



UNIVERSITY OF CALIFORNIA

Office of the Treasurer

601 INVESTMENT RISK REPORTING

NEW REPORTS: TOTAL FUND RISK &
ABSOLUTE RETURN PORTFOLIO RISK

*Committee on Investments /
Investment Advisory Committee*

May 04, 2004

RISK QUESTIONS

- ◆ What are the Total Fund's risk exposures
 - How do they compare to policy targets?
- ◆ How much, at the margin, does each Portfolio contribute to Total Fund risk
 - Is the risk contribution proportional to expectations for return?
- ◆ What are the risk exposures in the Absolute Return portfolio
 - What proportion of risk is coming from systematic factors?
 - How does it impact total fund risk?

- ◆ Goal of Treasurer's report to Committee
 - *What returns were achieved*
 - *What risks were taken to earn the returns*
- ◆ Risk includes
 - *Portfolio characteristics*
 - *Performance attribution*
 - *Sector / country / quality exposures*
- ◆ Risk also includes
 - *Measures of volatility*
 - *Contribution of sector / portfolio risk to total*
- ◆ Next quarter: aggregate small cap risk

- ◆ Treasurer is now implementing **holdings based** factor models for equity and bond risk forecasting
- ◆ Currently using **returns based** factor model developed by Prof. William Sharpe*
- ◆ Extension of his “Style Analysis” research
 - *21 risk factors cover global investable universe*
 - *Segment capital markets into 21 non-overlapping style factors*

* UCLA grad



FORECAST RISK

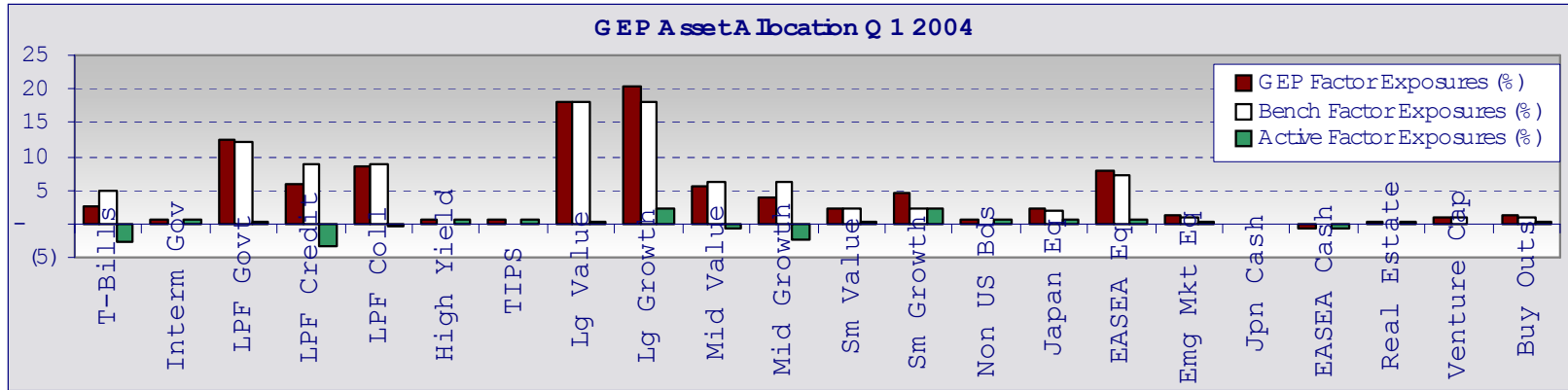
FO RECAST RISK (1)	
G EP	10.58
Benchm ark	10.05
Active R isk	0.63
Beta	1.05

- ◆ The top table shows an **estimate** of the total fund and benchmark risk
- ◆ Units are **standard deviation** of returns, annualized
 - Range around expected return where the actual one-year return should fall in roughly two of every three years
- ◆ **Active** risk is currently very low
 - Passive management of equity and
 - Current strategy in the bond portfolio
- ◆ **Beta**, or overall degree of market exposure is close to neutral



RISK FACTOR EXPOSURES

FACTOR EXPOSURES (2)			
Asset Allocation (3)	Actual	Benchmark	Active Weights
Domestic Equity	54.9	53.0	1.9
Domestic Fixed Income	28.8	30.0	(1.2)
Non US (all)	11.3	10.0	1.3
Non Marketable	5.1	7.0	(1.9)
TOTAL	100.0	100.0	(0.0)

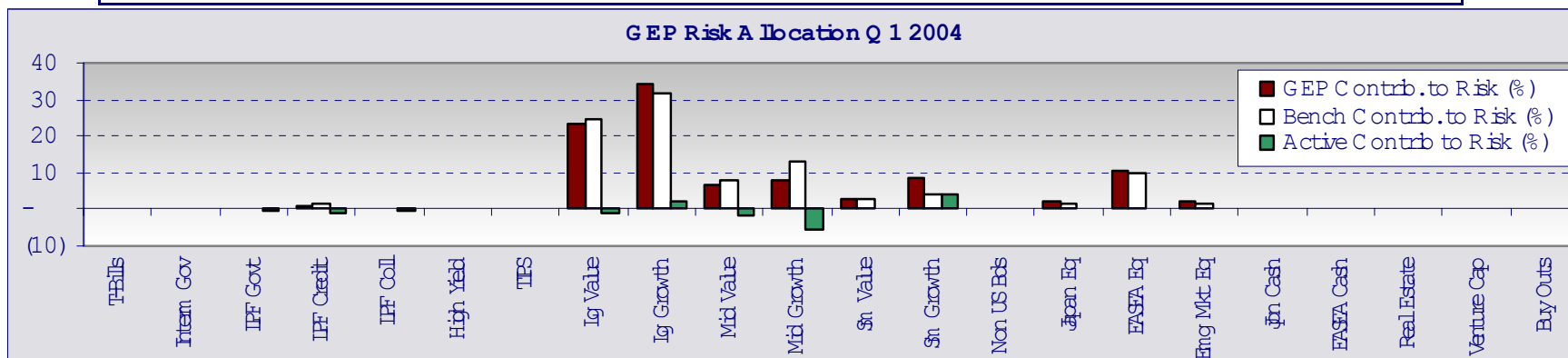


- ◆ Each portfolio's monthly return is regressed against these risk factors to determine its implied risk exposures
- ◆ Exposures are then aggregated by using current market weights and compared to the components of the policy benchmark
 - Units are in percent, so that the sum of all bars is 100
 - Differences in exposure (between total fund and benchmark) sum to zero
- ◆ Small differences in risk shown are consistent with the assets weights as of quarter end.



RISK FACTOR CONTRIBUTIONS

RISK CONTRIBUTIONS (4)			
Risk Allocation (3)	Actual	Benchmark	Active Risk
Domestic Equity	83.2	84.0	(0.9)
Domestic Fixed Income	1.6	2.5	(0.8)
Non US (all)	14.6	13.3	1.3
Non Marketable	0.3	0.2	0.2
Subtotal Factor Risk	99.7	100.0	(0.3)
Residual Risk	0.3	-	0.3
TOTAL	100.0	100.0	0.0



- ◆ Each factor contributes to total risk based on **risk (volatility)** of the factor and **covariance** of that factor with other factors
- ◆ **Contribution** of that factor to the total risk is result of weighting the variance and covariance of each component
 - Expressed in percent, sum to 100
- ◆ It may - or may not - be surprising how **disproportional** is equity's contribution to risk, compared to its actual (and benchmark) weight, and compared to fixed income risk.

- ◆ First use of a risk model is to measure risk exposures and contributions
- ◆ Then compare those measures to:
 - A **benchmark**, some pre-assigned **limits**, or **qualitative understanding** of the portfolio's strategy
- ◆ This is an important component of the total investment oversight process
 - Includes both qualitative and quantitative analysis
- ◆ The value of a quantitative risk model:
- ◆ **Contribution** of a single position or sector to total portfolio risk depends on **more than just its size**
 - Depends on the **volatility** of that position
 - Depends on its **covariance** with the rest of the portfolio

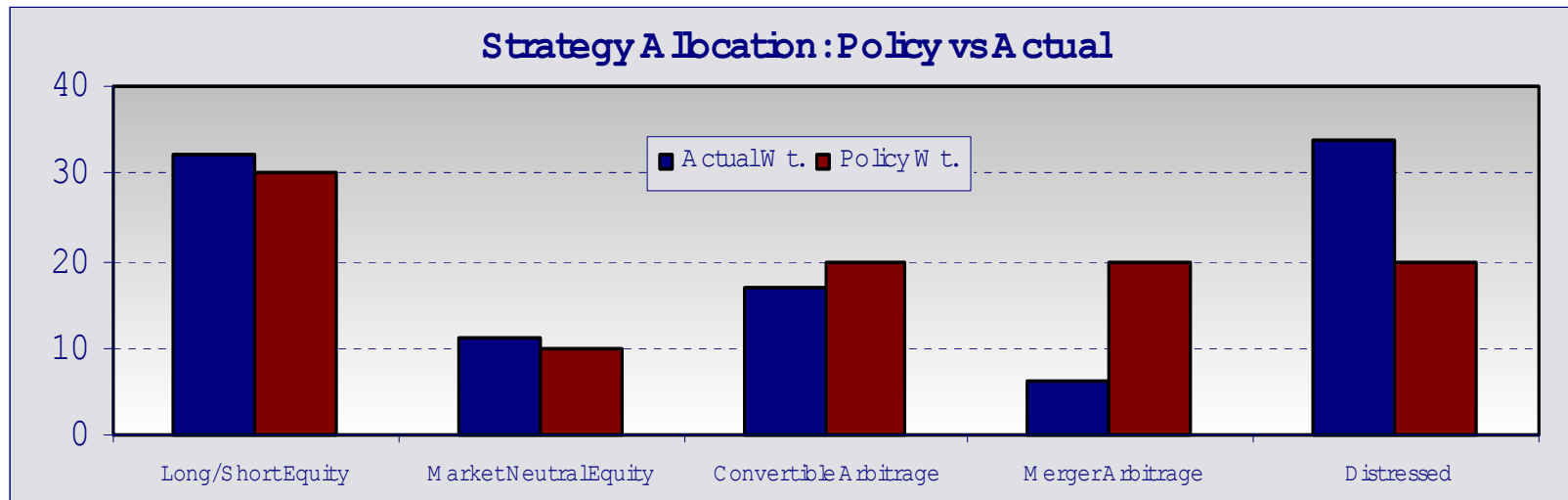
USES - RISK BUDGETING

- ◆ Second use of a risk model is to aid in risk budgeting:
 - Allocation of risk in proportion to expectations for return
- ◆ Manager will take positions **different from consensus** only if she has expectation to earn excess returns
- ◆ Size of the active position should depend on
 - Expected out-performance
 - Degree of confidence in one's beliefs
 - Risk it **contributes** to the rest of the portfolio.
- ◆ Risk budgeting is the process of constructing a portfolio so that each active weight should be sized so that, at the margin, its **contribution to expected return** is proportional to its **contribution to risk**

ABSOLUTE RETURNS RISK

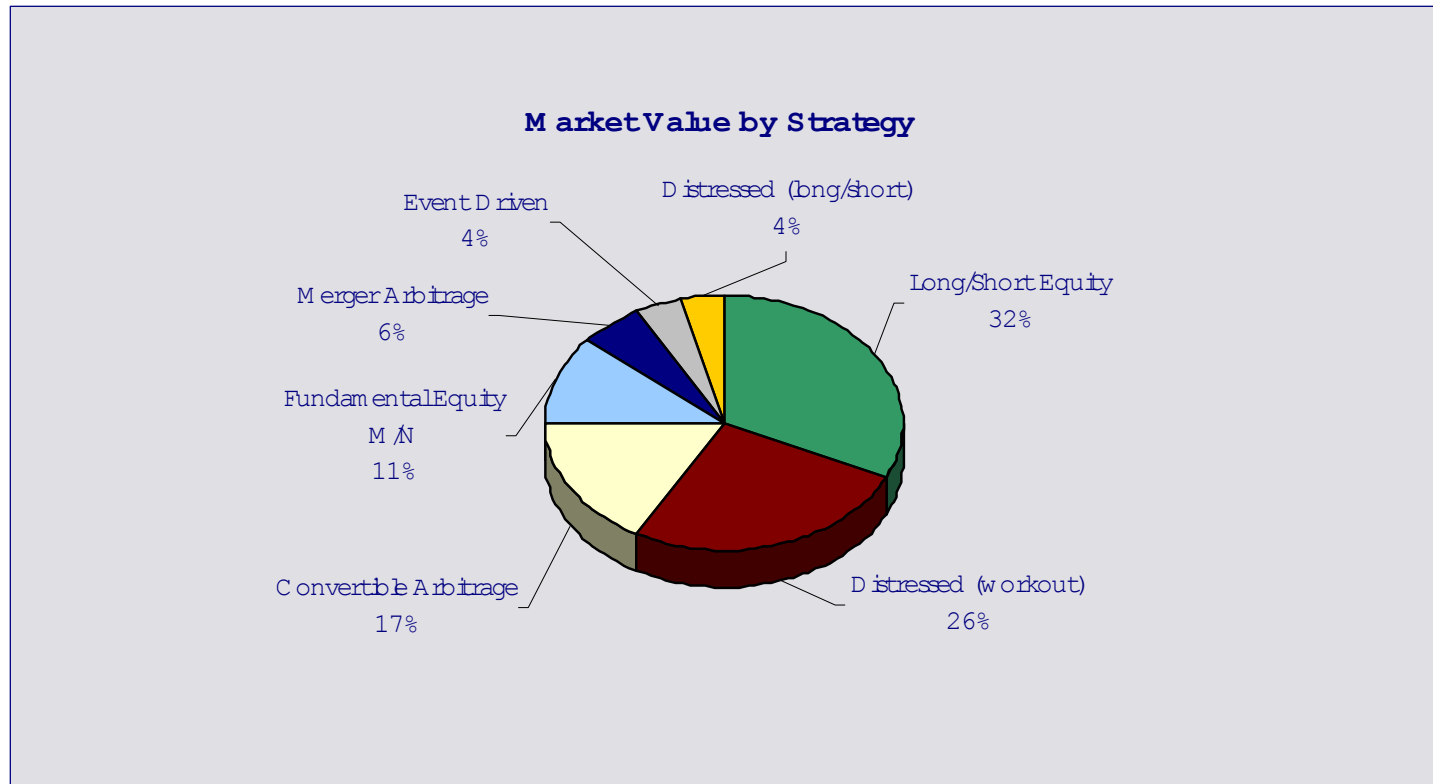
- ◆ Regents' Absolute Return consultant, Albourne Partners, performs due diligence on AR managers in parallel with Treasurer's office
- ◆ Albourne also uses a **returns based risk factor model** to estimate risk
- ◆ First step is to identify systematic (market) exposures in each manager and estimate that risk
 - Systematic risk is **not** absent from absolute return strategies
- ◆ Second step is to estimate residual (idiosyncratic) volatility

ABSOLUTE RETURNS GUIDELINES

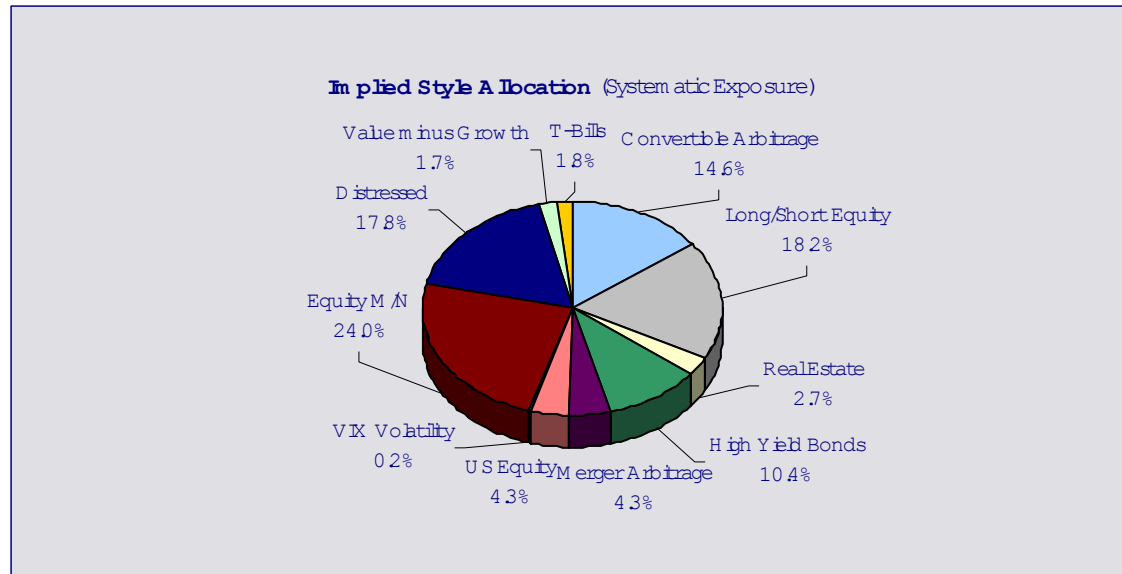


- ◆ Investment guidelines for AR include an allocation among **five main investment strategies** approved by the Regents
- ◆ These are **neutral positions**, with broad latitude for shifting allocations in response to market conditions
- ◆ The first chart shows the assets (by market value) invested in each broad strategy, along with the policy allocation
- ◆ **Current** market opportunities in merger arbitrage limited; balance invested in distressed/credit sector

ABSOLUTE RETURNS STRATEGIES

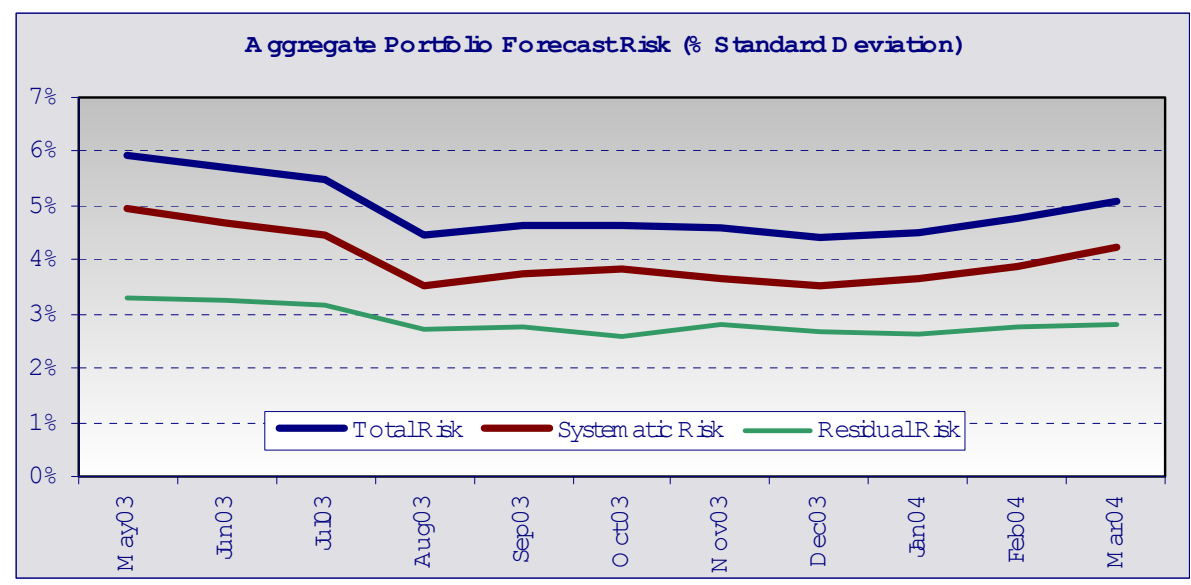


- ◆ The second chart shows further detail on the current allocations to investment styles within each broad strategy

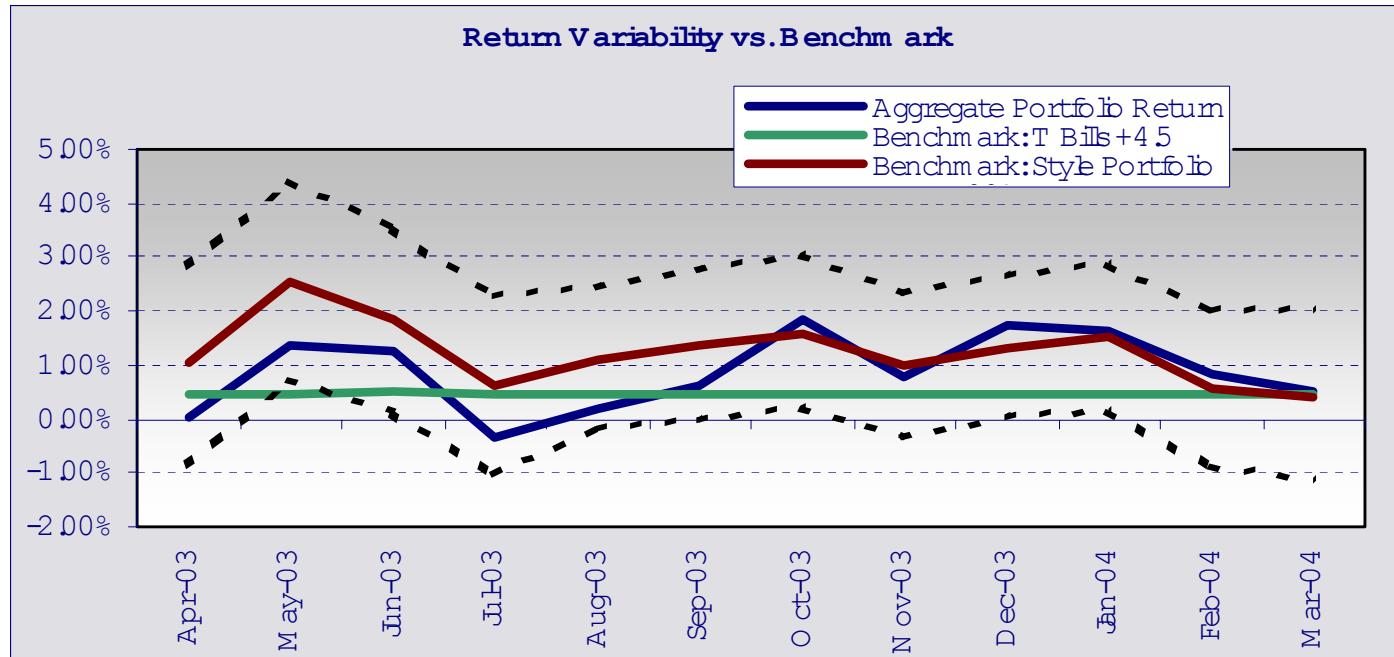


- ◆ Very few AR strategies are truly “market neutral”
- ◆ Part of return is due to **exposures** to **systematic** or market risk
 - Usually managed more strictly than by a traditional “long only” equity or bond manager (who is expected to take market risk)
- ◆ Principal systematic risk exposures for each manager have been identified and quantified
 - Methodology similar to William Sharpe’s “Style Analysis”
- ◆ Graph shows the **weighted** exposures for the **aggregate** portfolio

ABSOLUTE RETURNS RISK MEASURE.



- ◆ Forward looking estimate of **aggregate systematic** risk (red line)
 - Combines systematic exposures, their volatilities and covariances
- ◆ Estimate of **residual** (non systematic) risk (green line)
 - Volatility of the monthly difference between manager total return and systematic return
- ◆ Estimate of **total risk** is shown in blue (sum of variances)



- ◆ Monthly **aggregate fund returns** (blue line) compared to
 - Official benchmark (green line) and
 - Benchmark consisting of the **style portfolio** (red line)
 - ◆ i.e., the monthly return of the systematic exposures shown in chart 3
- ◆ 90% **confidence** band (1.28 standard deviations) is shown around the style portfolio
 - Actual performance is within risk **expectations**

- ◆ US equity factors
 - *Large Cap Value & Growth, Mid Cap Value & Growth, Small Cap Value & Growth*
- ◆ US Bond factors
 - *Intermediate Gov't, LPF Gov't, LPF Credit, LPF Collateral, TIPS, High Yield*
- ◆ Non US equity factors
 - *EAFE ex Japan, Japan, Emerging Markets*
- ◆ Non US Bond factors
 - *Developed ex-US bonds, EAFE ex-Japan currency basket, Yen*
- ◆ US Illiquid Assets
 - *Real Estate, Venture Capital, Buyouts*

- ◆ **Market benchmarks** capture the choices to over or underweight classes of securities
 - *US equity, US Value Equity, Value minus Growth, Govt/Corp Bonds, High Yield Bonds, Real Estate, VIX Volatility*

- ◆ **Hedge fund peer group** median returns [sub-sectors of HFR manager universe] are used to **proxy** the risk in certain investment styles
 - *Convertible Arb, Equity L/S, Fixed Income Arb, Merger Arb, Barclay CTA Index, Macro, Statistical Arb, Relative Value, Equity M/N, Distressed, Short Selling, Mortgage Arb, Event-Driven*