



Office of the Treasurer of The Regents

University of California

Investment Risk Management Update

UCRS Board
February 2010

Outline

- Investment Risk Management: Today and Tomorrow
- UCRP Investment Risk Report 4Q 2009



Mission/Objectives

- Mission
 - To ensure that the investment activities do not expose the University to **potential** or unexpected **losses** beyond the Regents **risk tolerance levels**
- Objectives
 - **Identify and bound** possible losses for all portfolios
 - Develop and monitor guidelines and limits on the investment process to **maintain** the probability of loss **within acceptable limits**



Risk Management Roles

- Fiduciaries **approve** investment policy
 - Express **tolerance** for risk
 - **Asset allocation, benchmarks, guidelines**
- CIO/staff **implements** policy
 - Maintain asset weights within set ranges
 - Select strategies and managers
 - **Allocate** risk to various strategies
- Risk management **ensures** policy is followed
 - Risk exposures are appropriate and properly diversified
 - Risk is adequately rewarded



Risk Measurement and Models

- Measuring risk is not as simple as computing past (“realized”) **volatility of returns**
- However, volatility is useful to know: it indicates the **range of past outcomes**
- A **risk measure** is an estimate of future **potential losses**, given current conditions
- A **risk model** is a **methodology** to measure risk for portfolios based on the **current holdings**



Risk Measurement and Models *continued*

- We use “**factor models**” which identify common sources of risk among similar securities
 - E.g., common movement of all stocks in an industry
 - E.g., credit quality of corporate bonds
- Risk measurement consists of:
 - **Exposure to** risk factors
 - **Volatility of** those factors
 - **Co-movement of** risk factors
- Risk and risk measurement is **multi-dimensional**



A Common Language

- The innovation of risk management is a **common framework** and **uniform metric** to quantify all investment decisions
- Allowing us to **trade-off** risk in one area with risk in another
- A **risk budget** is an optimal allocation of a given level of risk to various investment choices
- If we have “used up” our risk budget, we must **reduce risk in one** or more strategies in order to **take risk in another one**



Traditional Management of Risk

- Managing investments has always been about **managing risk**
- Traditionally done with inefficient **guidelines and constraints**, e.g.,
 - Position and sector limits
 - Limits on manager size
 - Long only constraint
 - No derivatives
 - Credit limits
- These are all examples of **risk proxies**
- Why not manage the risk factors **directly**, and link risk to expected return?



Why Is This Inefficient?

- Constraints are **proxies** for risk; **crude** (but sometimes effective) risk **controls**
- They don't account for actual **contribution to risk** of different positions
- Constraints don't account for **volatility, correlations, or hedges**
- Constraints cannot be **combined or traded off** against each other



Are the Risk Models “Broken?”

- The risk models used at the Office of the Treasurer are **not** the same as the models the Rating Agencies used to give AAA ratings to CDO’s backed by sub-prime mortgages
- However, **all** risk models use the past volatility of securities and markets as inputs to generate forecasts
- The period preceding the 2007-9 decline experienced low volatility, and so most risk models **underestimated** the range of possible outcomes
- “Experience is a hard teacher; she gives the test first and the lesson afterwards”



Emerging Consensus

- Risk measures should be somewhat **counter-cyclical**
 - To enable Buffet-type contrarian strategies
- Develop risk measures which are **less dependent on price movements**
 - Incorporate **macro-environmental** signals
 - Focus on **avoiding loss**, rather than reducing volatility
 - Use models appropriately, to **ask questions** not to give answers
- Continually **question**
 - What assumptions are built into our models?
 - What if we are wrong? (to balance overly optimistic portfolio managers)



What **Can't** We Do Better?

- Predict when market indexes will decline precipitously
- Predict turning points in market indexes
- Predict how long trends will continue
 - Trends in return
 - Trends in volatility
 - Trends in co-movement of risk factors



What Can We Do Better?

- Combine **economic and asset valuation** signals in risk forecasts
- Focus more on **total risk**, as well as risk relative to the benchmark
- Recognize the **limits of the normal** distribution in measuring and interpreting risk (e.g., “fat tails”)
- Replace correlations with more general measures of return **co-variation**
- Focus more on **downside risk**, and on the explicit trade-offs of adopting a more conservative position when **risk measures decrease but risk seeking behavior increases**





Office of the Treasurer of The Regents

University of California

I-1 UCRP and GEP Quarterly Investment Risk Report

Committee on Investments/
Investment Advisory Group
Quarter ending December 2009

February 23, 2010



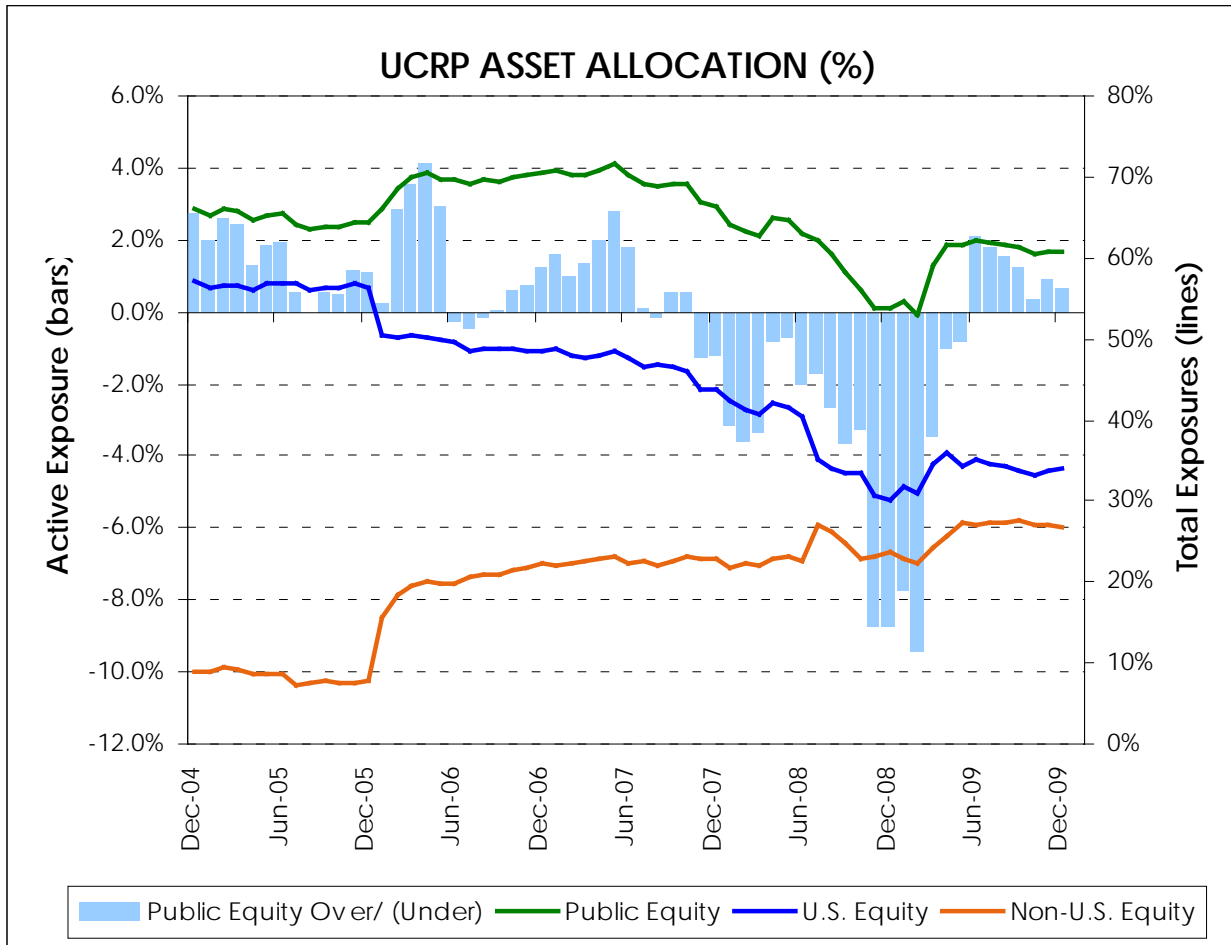
Risk Overview 4Q 2009

- The fourth quarter of 2009 was a good quarter for risk taking. US Equity, Emerging market equity, US REITS, High yield bonds, and commodities all rose 6% or more in the quarter.
- Major index volatilities – a measure of risk aversion - were close to their two-year lows.
- Only U.S. Treasuries declined, and Long Treasuries declined more than 6%, another indication that the market loved risk.
- Two other favorite risk indicators, the VIX index of equity option volatility, and the spread of credit yields over treasury yields, both continued to decline over the quarter.



Asset Allocation

- Total Risk is largely related to the allocation between equity and bonds
- Total equity slight **overweight** continued throughout Q4 2009



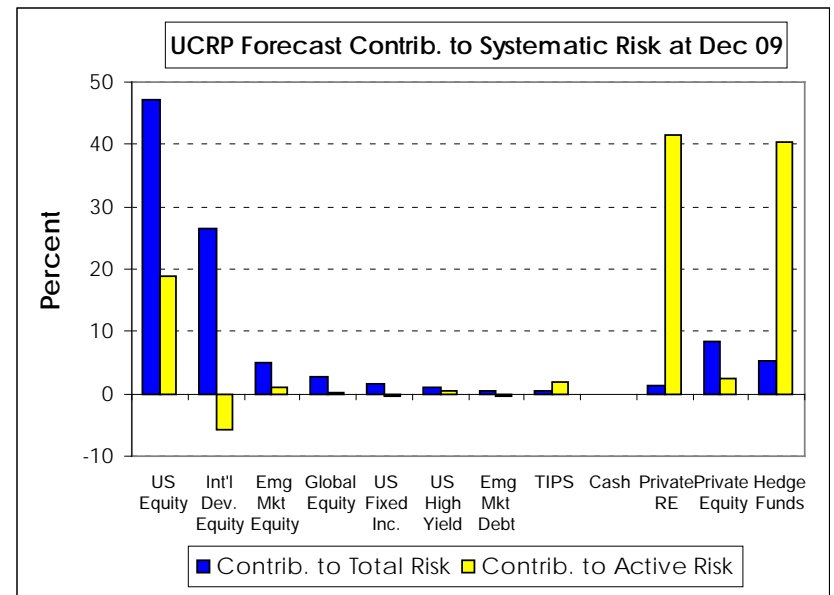
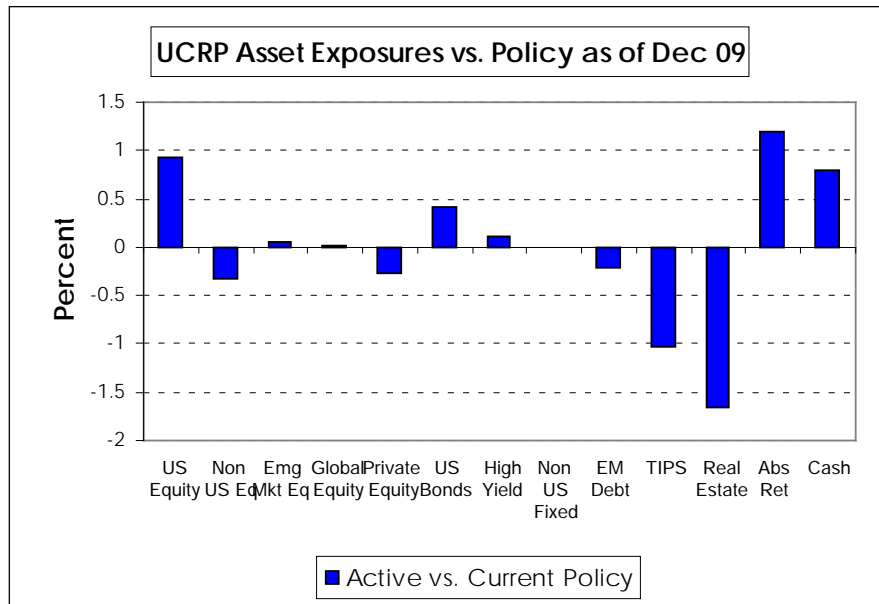
Asset Allocation and Risk

Note: Exposures and Risk charts below are shown using June 1, 2009, target asset weights. Systematic risk is estimated using long term forecasts [from Mercer Investment Consulting, March 2009], **not** recent realized volatility.

(Lower Left) Asset weights are measured relative to **Current** Policy. The fund has an overweight in Public Equity, Absolute Return, and cash, and an underweight in TIPS and Real Estate.

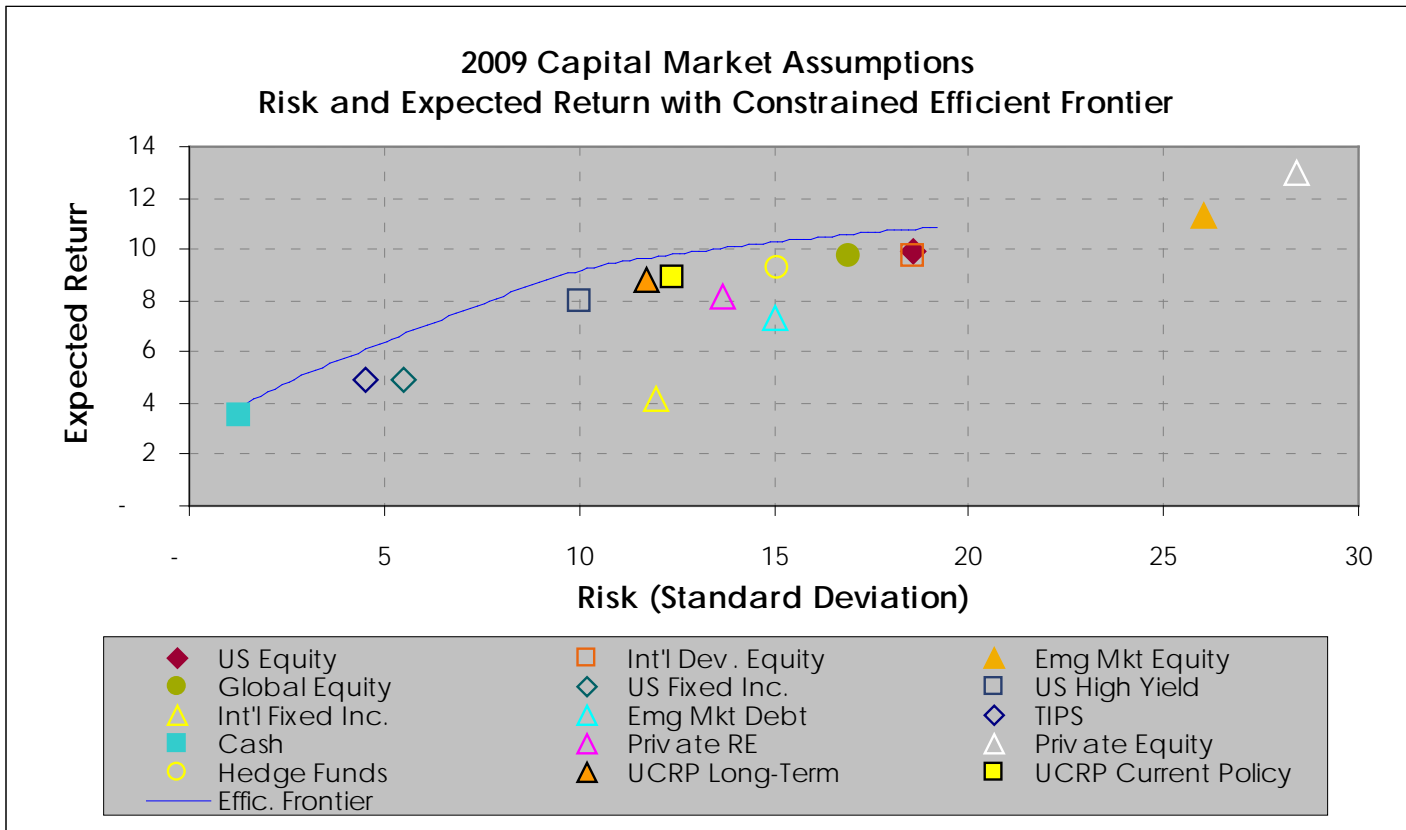
(Lower Right)

- The fund's forecast total systematic risk (blue bars) is unchanged at 12.50% annualized standard deviation. It is heavily weighted to US and Non-US developed equity (74% of total).
- Forecast active systematic risk is unchanged at 30 bp. The Real Estate / Private Equity underweight and Absolute Return overweight accounted for over 80% of this amount (yellow bars).



Expected Risk and Return

Forecast risk and return (using Mercer's April 2009 capital markets assumptions) lies near the constrained efficient frontier; long-term forecast return of 8.1%* is close to the actuarially required return of 7.5%.

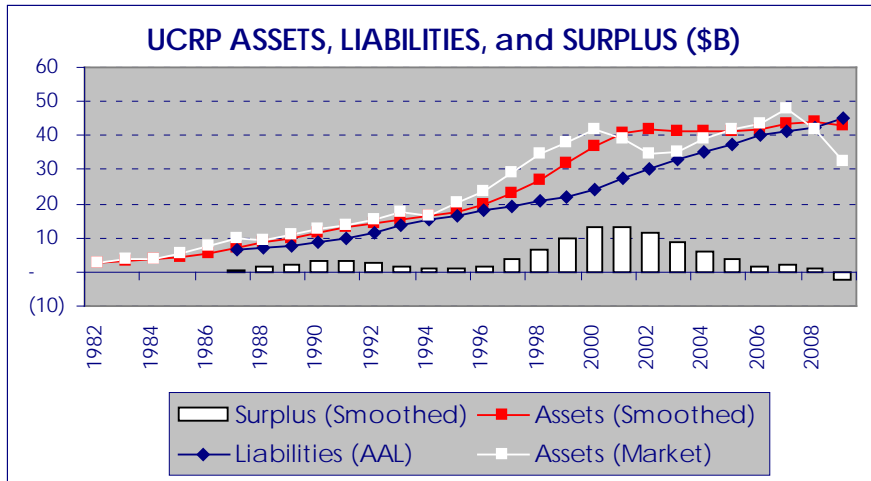


*Asset Class returns and efficient frontiers are shown in the chart as arithmetic (i.e., average) expected returns.

The projected compound annual return over multi-year horizon is 8.1% for the **Current Policy** weights.

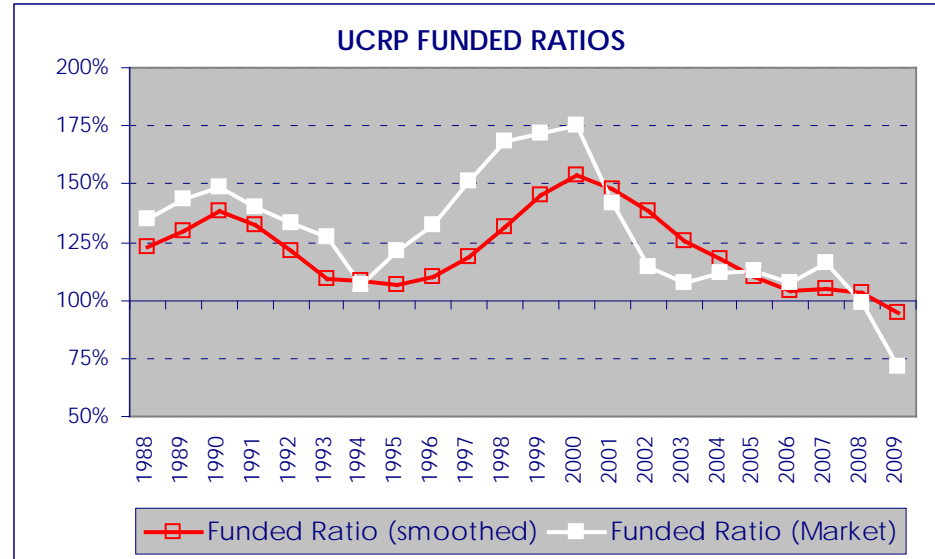
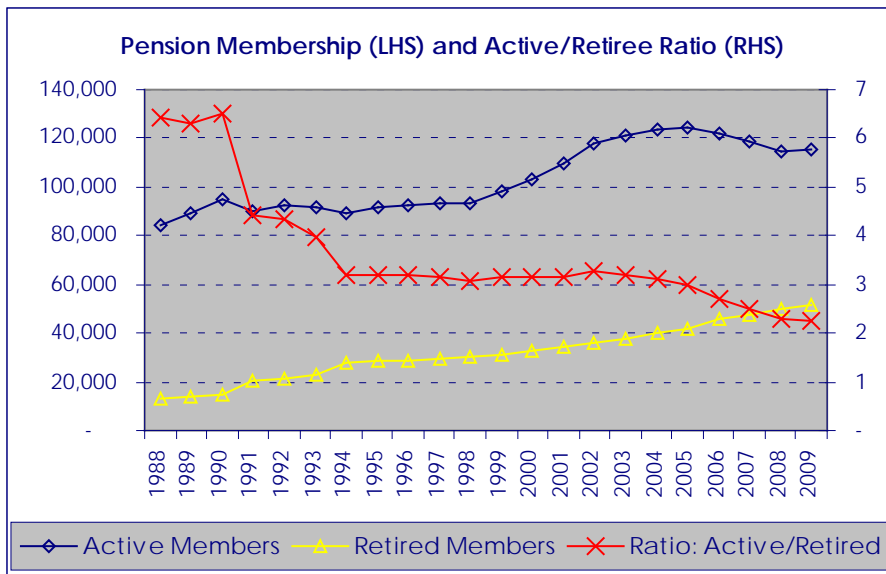
Forecast volatility is 12.4%.

Historical Funded Status

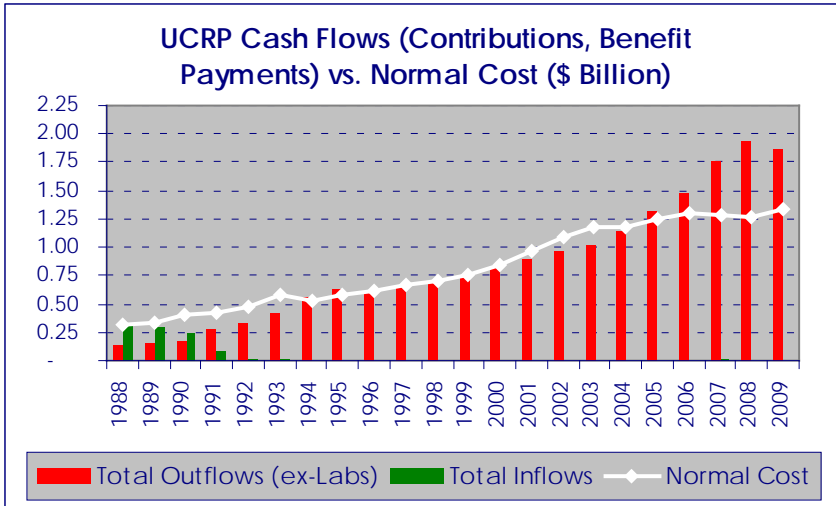


The Pension Fund's liabilities have been growing steadily (**upper left**) with University employment, while the assets have grown (and fallen) with the equity markets. The ratio of actives to retirees has recently fallen from 3x to 2x (**lower left**).

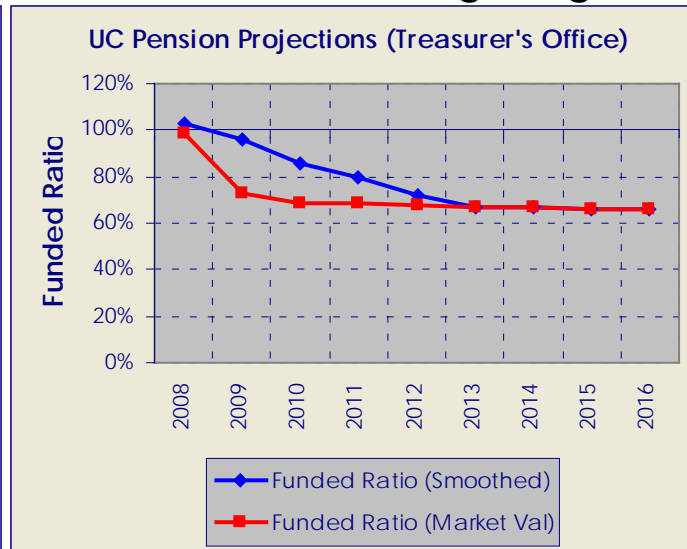
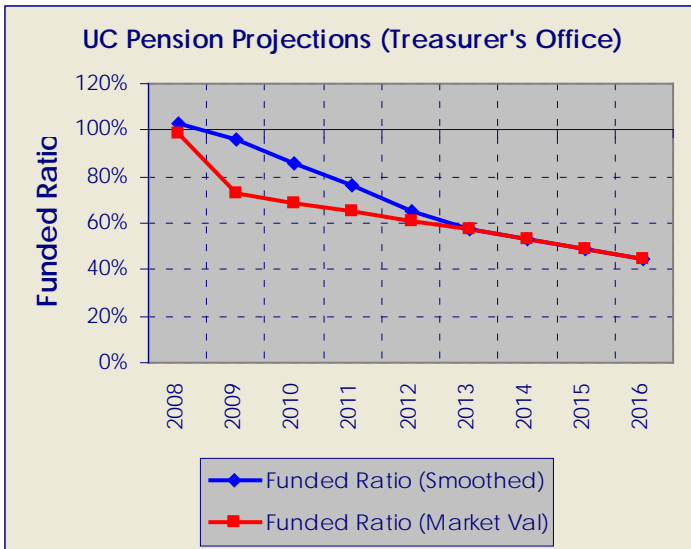
The Funded Ratio (= the ratio of assets to liabilities), is an overall metric of the financial health of a pension plan. This ratio has fluctuated considerably over the past (**lower right**), and has recently fallen below 100% with the bear market of 2007-09



Forecast Funded Status

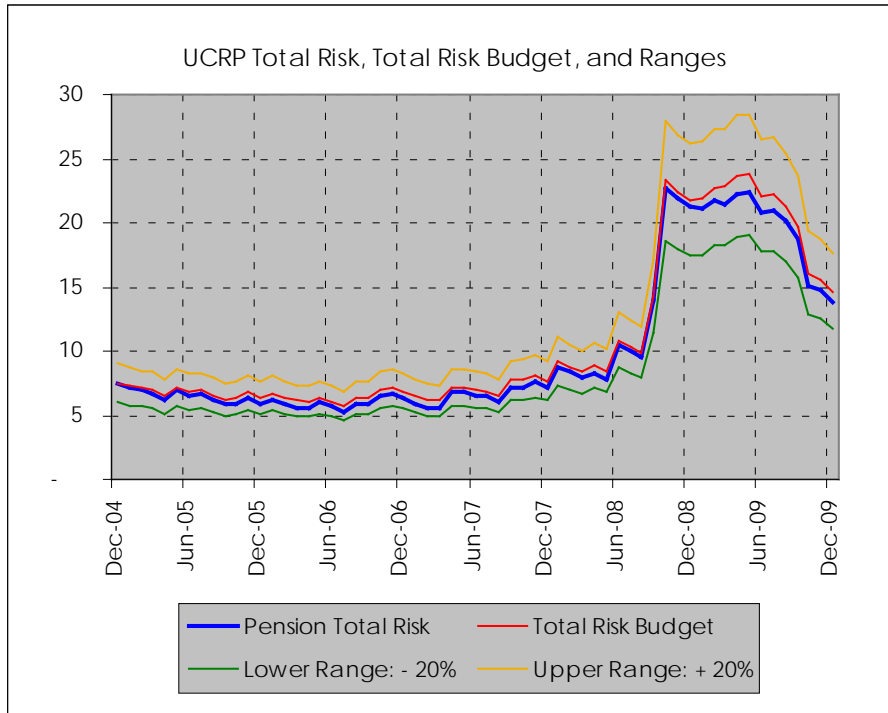


- Contributions were suspended in 1990, but annual benefit payments have grown in line with and recently exceeded, Normal Cost over the last decade (**upper left**).
- The **bottom** two charts show projected funded ratio **without and with contributions**, assuming a **-19% return for FY 2009** and a **constant 7.5% investment return beginning FY 2010**. (For this example, **contributions were set to be equal to forecast Normal Cost, beginning FY 2011.**)



- LEFT: Assumes **no contributions**, 7.5% annual investment return after FY 2009
- RIGHT: Assumes **Normal Cost contributed annually** beginning FY 2011; 7.5% return after FY 2009
- **These projections are approximations only, developed by Treasurer's Office, not Segal Co.**

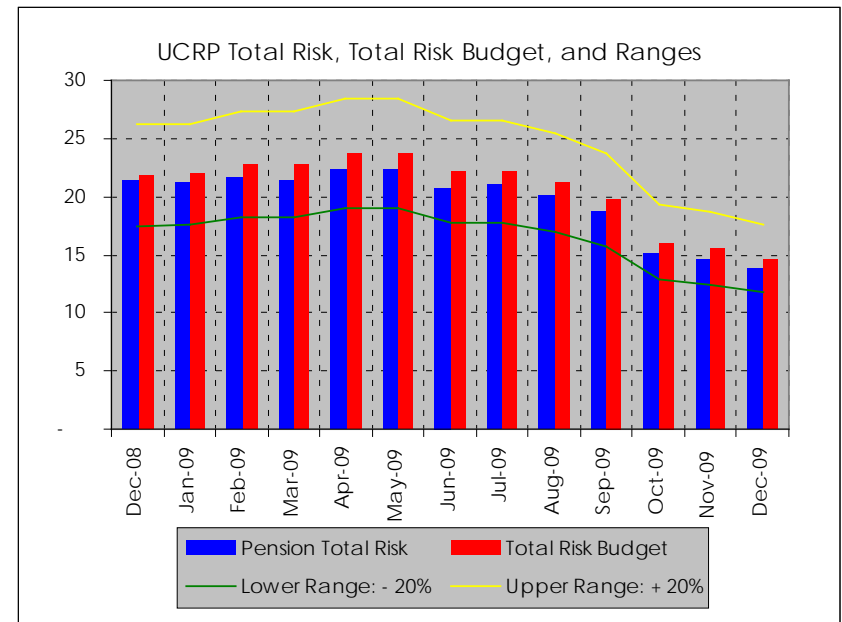
Risk Measures: Total



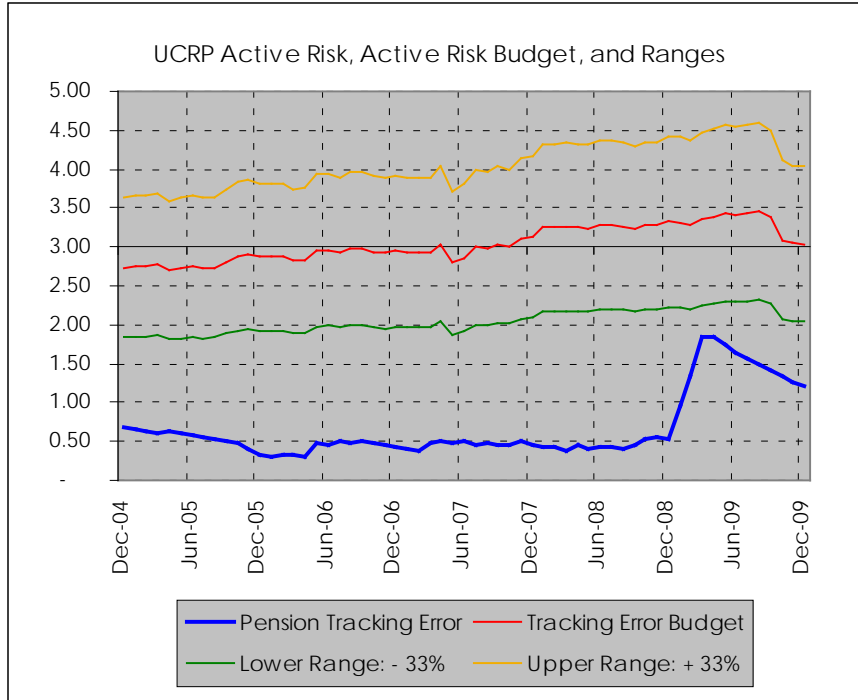
Total risk trend quite similar to benchmark; recently Plan volatility has been slightly less than the Budget, but well within ranges. Total volatility has been moving higher since July 2007, and spiked up in October 2008 and remains high, but is trending downward.

Total Risk budget equals Benchmark risk plus the Active risk budget. The ranges are +/- 20% around the budget.

Risk is measured by standard deviation of monthly **total** returns; each point or bar shows a 12 month measurement period. All risk calculations done using exponentially declining weights. (This and following charts show risk budgets as if they had been in place during entire historical period.)



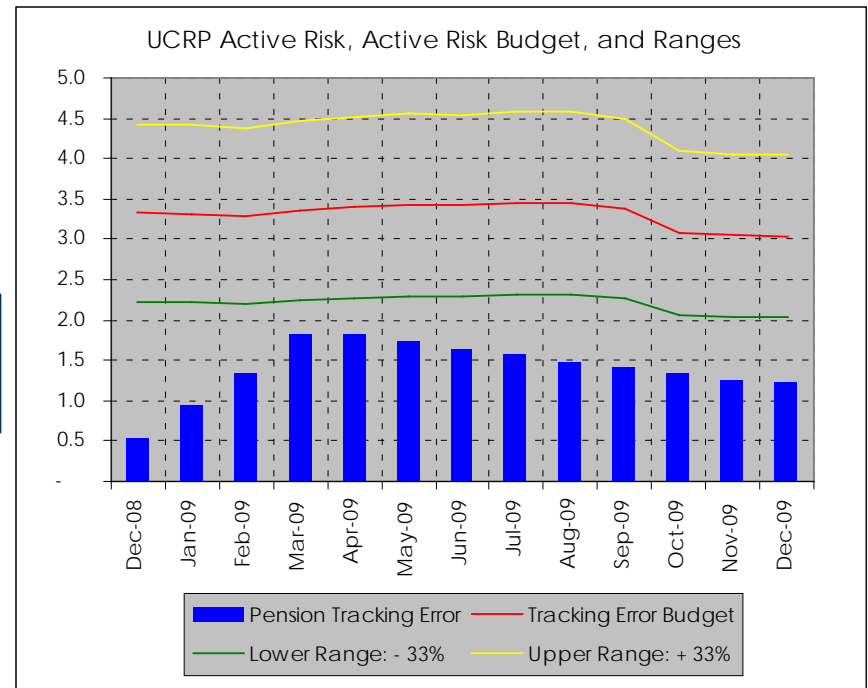
Risk Measures: Active



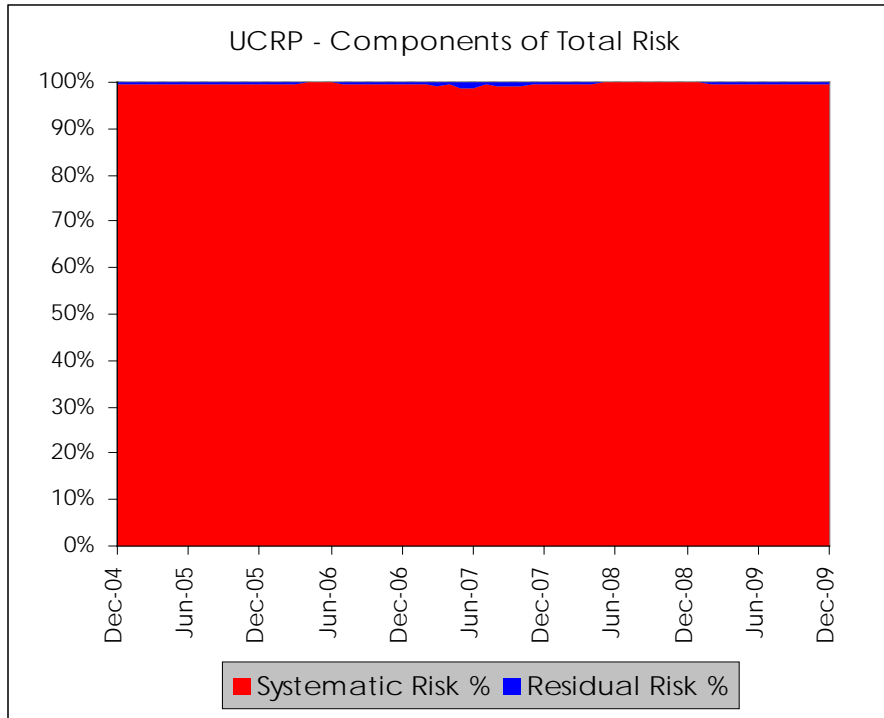
Until 2009, active risk for the total fund has held steady at 0.50% annualized standard deviation. The spike up in Q1 09 resulted from the underweight in equity as the market fell and then rallied. Active risk remains higher than 2008 levels due to higher market volatility, but is still well below long term expectations for active return, and is well diversified.

The Active risk budget is 3% annualized Tracking Error (adjusted for market volatility), with ranges of +/- 1 pct. point around Budget

Risk is measured by standard deviation of monthly **active** returns; each point or bar shows a 12 month measurement period. All risk calculations done using exponentially declining weights.



Risk Attribution

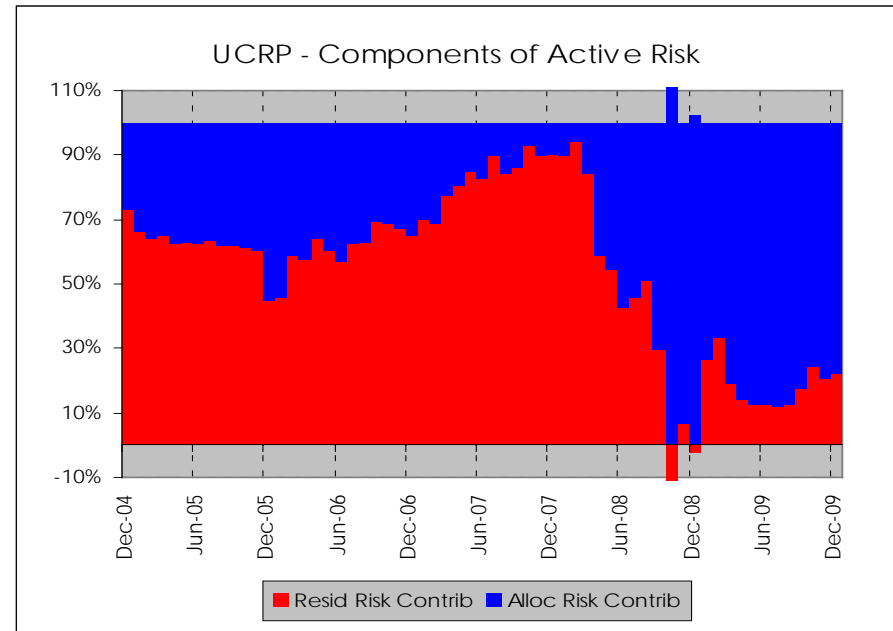


(Upper Left) Almost all of **Total Risk** is attributed to systematic (market) factors.

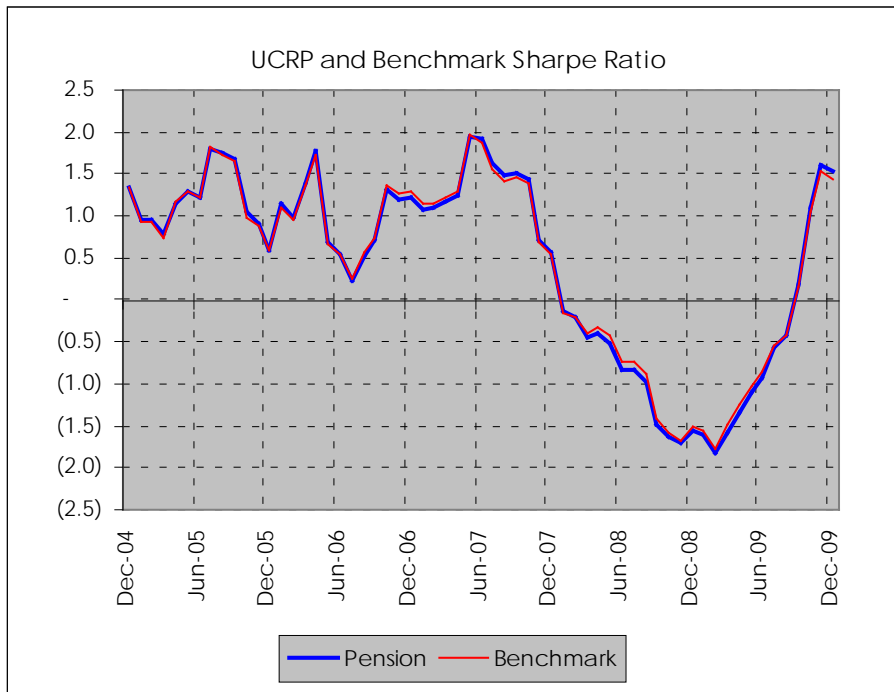
(Lower Right) Normally, the majority of **Active Risk** is attributed to security selection. When active management is reduced, or when asset allocation transitions are implemented, allocation risk increases. In the last 12 months, the equity over / underweight dominated all other decisions.

Risk is measured here by variance (standard deviation squared) of monthly returns; each bar shows a 12 month measurement period

Systematic Risk is associated with benchmark exposures; residual risk is associated with non benchmark decisions (security selection)

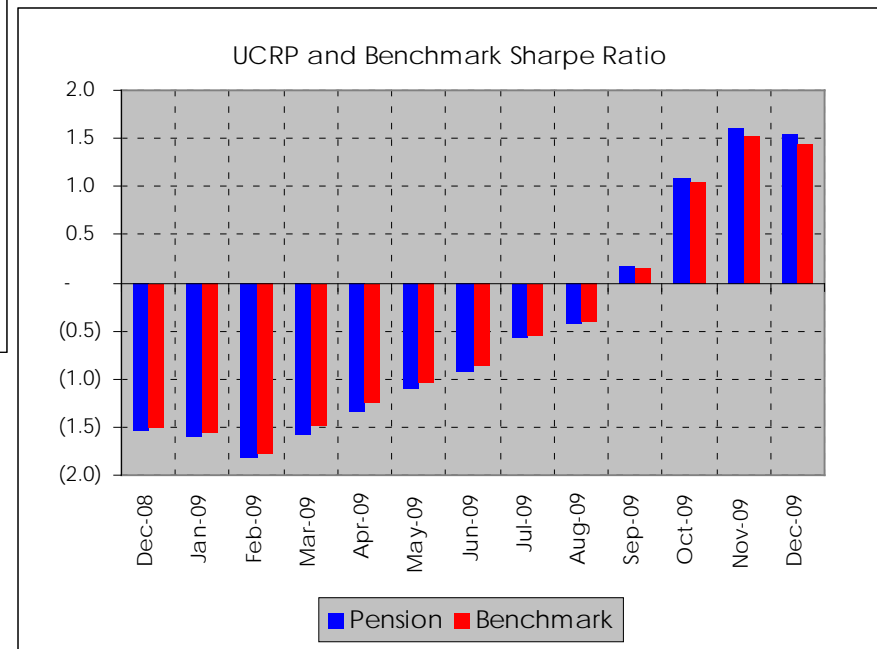


Risk Adjusted Return: Total

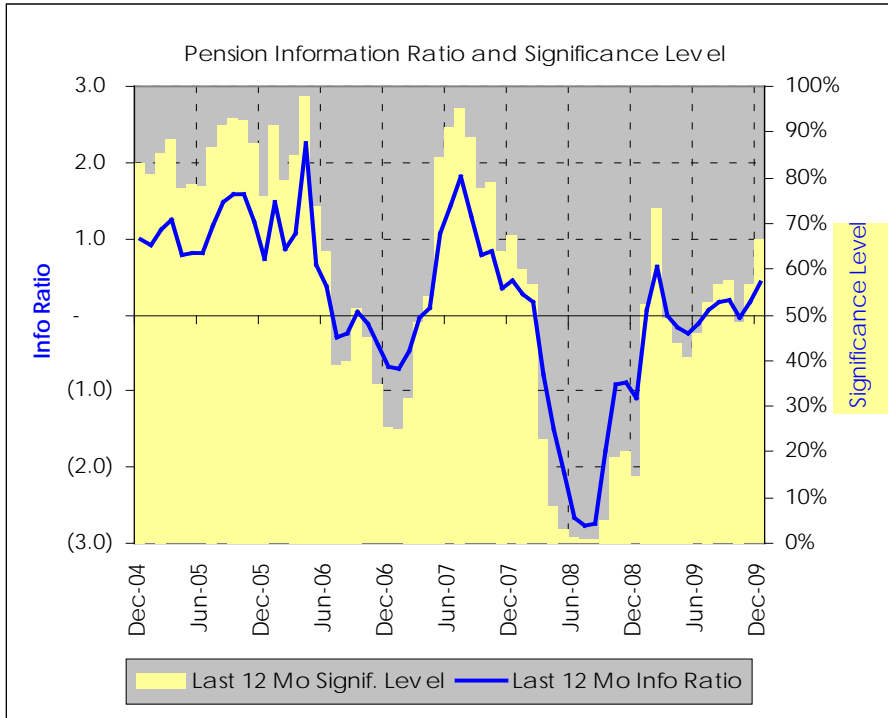


Sharpe Ratio (risk adjusted total return) trend has been quite similar to the benchmark for the past 5 years. The 12 month return on risky assets has finally turned positive as the March rally continues.

Sharpe ratio is "excess" return (total return less risk-free rate) divided by total risk; each point or bar shows a 12 month measurement period. All risk calculations done using exponentially declining weights.

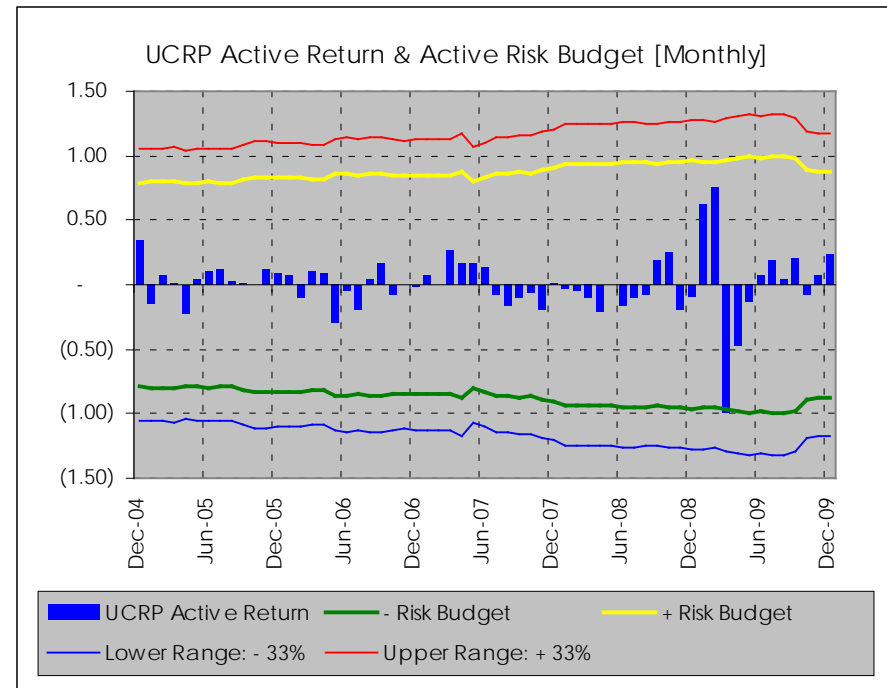


Risk Adjusted Return: Active



Information ratio is active return (total return less benchmark) divided by active risk; each point shows a 12 month measurement period. The Significance level is the probability that results are due to skill, with 50% being a neutral measure. All risk calculations done using exponentially declining weights.

Information ratio (risk adjusted active return) is the result of both asset weighting decisions and active performance. It is higher when the returns are positive and more consistent (less volatile). The Info. ratio in the last two quarters finally turned positive as market volatility decreased (see graph below).

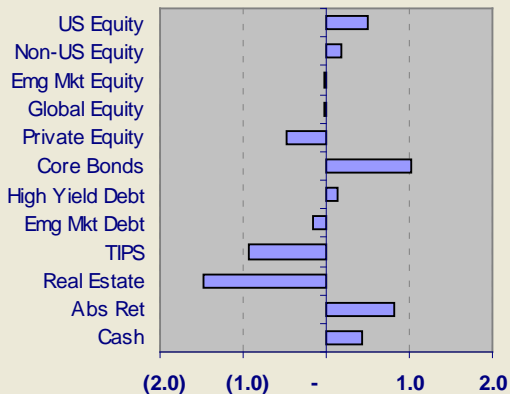


Performance Attribution

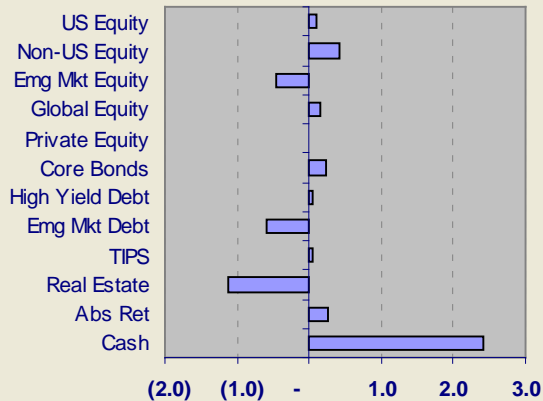
Active Return for the Quarter was +0.24% (Fund return of 3.69% vs policy benchmark of 3.45%).

[BELOW] Asset allocation decisions (**blue bars**) added 0.14% (primarily the underweight in Real Estate) and Security selection (**red bars**) decisions added 0.10% (primarily non-US Equity, offset by Real Estate)

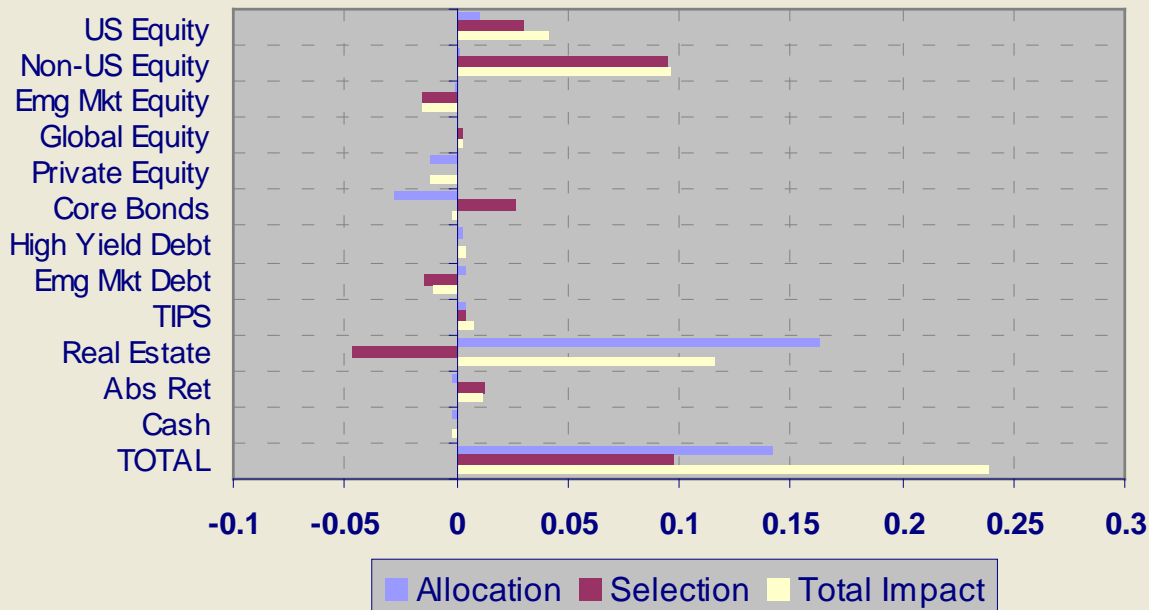
Avg. Active Weight



Avg. Active Return



UCRP Attribution for 3 mo. ending Dec-31-09



Performance Attribution

- UCRP volatility was close to its two year lows, similar to its aggregate policy benchmark.
- Of UCRP's total return of 3.7%, more than nine-tenths came from factor exposures, primarily equity.
- More than three-fourths of the portfolio risk is attributed to public equity (greater than its dollar share of the portfolio).
- The largest active exposures were also equity factors, and they contributed about three-fourths of the active return from asset allocation.
- Half of the active return and also half of the active risk came from manager / asset selection, so the portfolio risk exposures were well balanced.

