INVESTMENT RISK MEASUREMENT AND REPORTING

Committee on Investments / Investment Advisory Committee
January 7, 2003
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» Introduction to Investment Risk
» Organization
» Risk Policy
» Measuring Risk
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WHAT IS INVESTMENT RISK?

◆ **Risk** is the **chance of loss** accepted by an investor in order to earn a return
  - **Risk management** should **identify and bound** possible losses

◆ **Risk tolerance** measures the loss an investor is **willing to sustain** in order to generate an acceptable return
  - **Risk management** implements **guidelines and controls** on the investment process to **maintain** the probability of loss within acceptable limits
Risk is an **essential** part of investing

Risk in itself is intrinsically neither good nor bad - risk is a **scarce resource** used to generate investment returns

Risk management does not require the elimination of risk, but the **balancing** of risk and expected return

“**You can’t control outcomes, you can only manage risk**”*

* source: Peter Bernstein
Ensuring that sources of risk ("risk factors") are identified, understood, and quantified

Ensuring that assumption of risk is intentional and consistent with investment objectives

Ensuring that risks are adequately compensated (expected return is commensurate with risk)

Ensuring that the risk exposures in each portfolio are consistent with the risk target / budget set for that portfolio

Enabling fiduciaries to assume the maximum amount of risk consistent with investment objectives and standards of prudence
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The Investment Risk Manager’s primary objective is to ensure that the University of California Treasurer’s Office financial, investment and operational activities do not expose the University to potential or unexpected losses beyond the Regents risk tolerance levels.
RISK MGMT. PROCESS

1. Articulate risk tolerance

2. Develop risk policy, guidelines, and targets

3. Implement risk standards and methodologies

4. Periodic measurement, monitoring, analysis, and stress testing

5. Feedback, recommendations, and corrective actions

6. Review and revise process
STAFFING

◆ Director, Investment Risk Management
  ■ Develop and implement risk framework and processes
  ■ Conduct research in risk and portfolio management
  ■ Manage special projects and asset allocation studies

◆ Manager, Quantitative Analysis
  ■ Manage periodic measurement, analysis, and reporting process
  ■ Assist with special projects

◆ Risk Analyst
  ■ Assist with analysis and reporting
  ■ Manage databases and vendor data links
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Proposed risk policy for UC Regents

- Assumption of risk is **necessary** to meet plan objectives
- Risk should be taken **intentionally**
  - Regents / IAC should review risk exposures on a regular basis
- Risks taken should be **rewarded appropriately**
  - Goal of risk management is to **balance** risk and expected returns
POLLICY IMPLEMENTATION

- Regents express **tolerance** for risk in:
  - **Metrics** for risk (e.g., volatility)
  - **Targets and ranges** for those metrics

- Treasurers’ Office is responsible for:
  - **Budgeting (allocating)** risk to various strategies
  - **Measuring and reporting** risk vis a vis these targets and ranges
    - Measuring returns from risk exposures
  - Taking **corrective action** when risk falls outside range
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Investment risk is characterized jointly by the **possibility of loss** and the **severity of loss**.

The investment process is segmented into **multiple decision levels**, with different risk metrics for each level,

- **Surplus Risk**: risk of insufficient assets to meet liabilities / spending targets
- **Total Asset / Systematic Risk**: risk of underperforming strategic investment policy
- **Active / Residual Risk**: risk of unacceptable deviation from style or benchmark
The most widely accepted measures of asset risk focus on the volatility of returns.
- Typically around a benchmark or target return.

Two types of volatility measures are used:
- **Historical** (based on actual returns)
- **Forecast** or (based on current holdings)

Multiple approaches required, e.g.,
- Aggregate vs. components
- Absolute vs. relative
- Fundamental factors vs. statistical
- Total variability vs. negative outcomes

Volatility is a proxy for
- Return expectations
- Process quality
Diversification reduces risk, but “systematic” investment risks cannot be diversified

- Pension fund must be invested in the market
- Can be temporarily hedged, but it is costly

Principal investment decisions are

- Which market risks / systematic factors to assume
  - Managed through asset allocation and risk budgeting
- How much market risk to assume ("beta")
  - Greatest impact on total risk (after benchmark)
- How much non benchmark risk to assume ("residual")
  - Risk of multiple active strategies mostly diversifiable
  - Typically results in only a small increase to total risk
Assumes benchmark risk (volatility) of 10%
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  ■ Surplus and Spending Risk
  ■ Capital Market Assumptions
  ■ Asset Allocation and Equity %
  ■ Risk Decomposition
  ■ Total Risk and Active Risk
  ■ Active Risk and Return – Equity and Bond Portfolios
  ■ Equity and Bond Risk Factors
◆ Next Steps
UCRP FUNDED STATUS

Funded Ratio (Actuarial)

Source: UCRS Annual Reports
ENDOWMENT - SPENDING RISK

UC GEP Funding Ability

5% of Assets (Nom $)  5% of Assets (2002 $)

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Risk [X] and Return [Y] - Actual Results through Sept 2002

- 1992-1997
- 1992-2002
- 1997-2002

Legend:
- ▲ Last 5 Years - Fund
- ▲ Last 5 Years - Bench
- ▲ Last 10 Years - Fund
- ▲ Last 10 Years - Bench
- ■ First 5 Years - Fund
- ■ First 5 Years - Bench
Graph shows Wilshire risk and return assumptions for past four years for current policy allocation
ASSET ALLOCATION - PAST


Constrained Efficient Frontier, actual results, 5 YR ended 09/02

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ASSET ALLOCATION - FORECAST

Efficient Frontier, Wilshire 2002 asset class assumptions

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**RISK DECOMPOSITION**

**Historical Contribution to Risk - UCRP Total Fund**

- **Systematic Risk %**
- **Residual Risk %**

*Systematic = Risk from benchmark related decisions (incl. asset allocation)*

*Residual = Risk from other active decisions (manager and security selection)*

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RISK DECOMPOSITION

Contribution to Risk [Variance] UCRP Total Fund

Note: Systematic Risk differs from benchmark due to asset allocation and degree of market exposure ("beta")

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TOTAL (SYSTEMATIC) RISK

UCRP - Rolling 12 Month Portfolio Risk

“Rolling 12 Months” = each point represents volatility (standard deviation) of previous 12 months' returns (equally weighted)
"Active Risk" = volatility of difference between fund and benchmark returns
UCRP - Rolling 12 Month Active Risk

- Internal Equity
- Internal Bonds
EQUITY & BOND ACTIVE RETURN

UCRP - Rolling 12 Month Active Return (Geom)

- Internal Equity
- Internal Bonds

June 92 to June 02
“Information Ratio” = Active return (above benchmark) ÷ active risk
UCRP Bond Duration vs Benchmarks

- **SALOMON LPF**
- **LONG BOND**
- **BROAD MARKET**
- **UCRP Bonds**

- Jun-97
- Dec-97
- Jun-98
- Dec-98
- Jun-99
- Dec-99
- Jun-00
- Dec-00
- Jun-01
- Dec-01
- Jun-02
- Dec-02
UCRP IM Equity vs. Benchmarks: Price/Book

- UCRP
- Russell 3000
- S&P 500

Graph showing the comparison of UCRP IM Equity with benchmarks from Jun-98 to Sep-02.
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NEAR and MID TERM PRIORITIES

◆ Refine and expand quantitative analysis of bond portfolio, including risk measurement
◆ Develop comprehensive package of risk reports
◆ Develop risk policy consistent with plan policy documents
◆ Develop risk budgets consistent with risk policy and Regents’ risk tolerance
◆ Explore products for total fund risk measurement (including liabilities)
◆ Develop and train risk management staff