# Fresno County Employees' Retirement Association

**Asset-Liability Study**

**August 6, 2008**




Jeffrey J. MacLean

Sr. Consultant & CEO

## WURTS & ASSOCIATES

**SEATTLE**
999 Third Avenue
Suite 3650
Seattle, Washington 98104
206.622.3700 *telephone*
206.622.0548 *facsimile*

**LOS ANGELES**
2321 Rosecrans Avenue
Suite 2250
El Segundo, California 90245
310.297.1777 *telephone*
310.297.0878 *facsimile*

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# Executive Summary

- The current asset allocation is projected to have an investment return of 8.21% as compared to an actuarial assumed return of 8.00%.
- All mixes, including the current mix, project an expected full funded status by 2014.
- The implementation of an Opportunistic Fixed Income, Hedge Funds, and a Real Asset allocation meaningfully improves the efficiency of the existing portfolio. It also improves the expected funded status, minimizes projected contributions while also improving these metrics on a worst case basis.
- Wurts & Associates recommends the adoption of Mix #4 which increases the expected return by 34 basis points from the current allocation.
- Implementing this portfolio involves a 6.0% allocation to Opportunistic Fixed Income, a 9.0% allocation to Hedge Funds, and a 11.0% allocation to Real Assets (Real Estate, Infrastructure, TIPs, and Commodities).

# *I. Introduction*

# Introduction

- The asset assumptions were developed using the building block method.
  - Please refer to the Appendix for a thorough review on how our asset class assumptions were developed.
- Using mean-variance optimization, Wurts & Associates modeled five different efficient portfolios using the current asset classes and two additional asset classes.
- The actuarial assumptions used were taken from the Segal actuarial valuation report as of June 30, 2007.
- Wurts & Associates evaluated funded ratios and total contributions of the Plan using a variety of stochastic cases and a deterministic case:
  - In a deterministic case we assume we know what will happen in the future. We make our assumption and project that scenario.
  - In a stochastic case we make assumptions about input parameters and vary them projecting *many* scenarios (in this case, 2,000 scenarios) and then summarizing the results by looking at the distribution (percentiles) of the results. The projection is from 2007-2017 (fiscal years).

# Asset Allocation Decision Framework

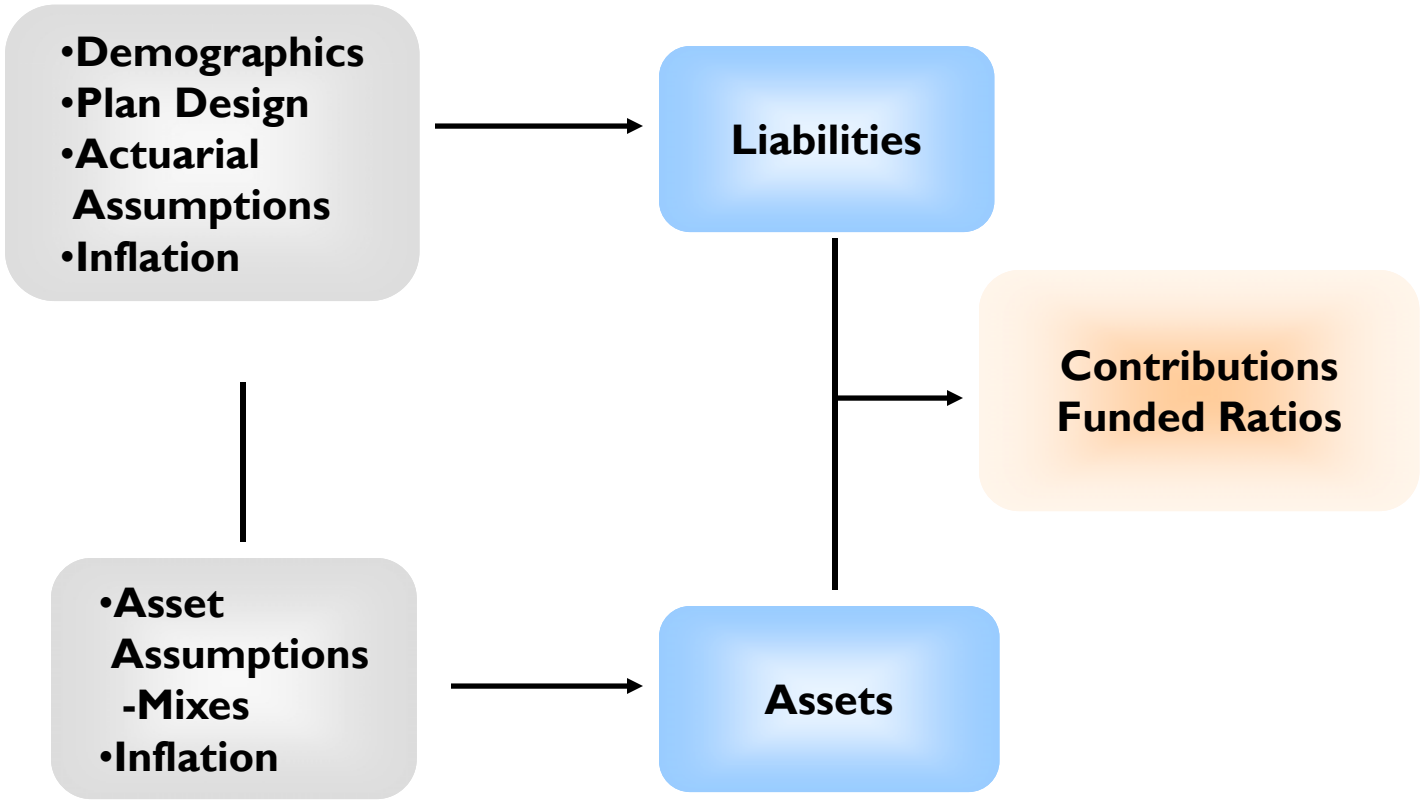
1. Establish the overall financial priorities for the plan
   - (i.e. funding contributions, funded status, etc.). This provides a quantitative framework to evaluate the potential asset allocation mixes.

2. Consider the tradeoff between expected outcomes and the worst case scenarios for these funding objectives.

3. Make a qualitative judgment regarding the risk tolerance of the Board of Trustees and the Plan's beneficiaries.

4. Consider the ramifications of failing with a less conventional allocation by including alternative asset classes.

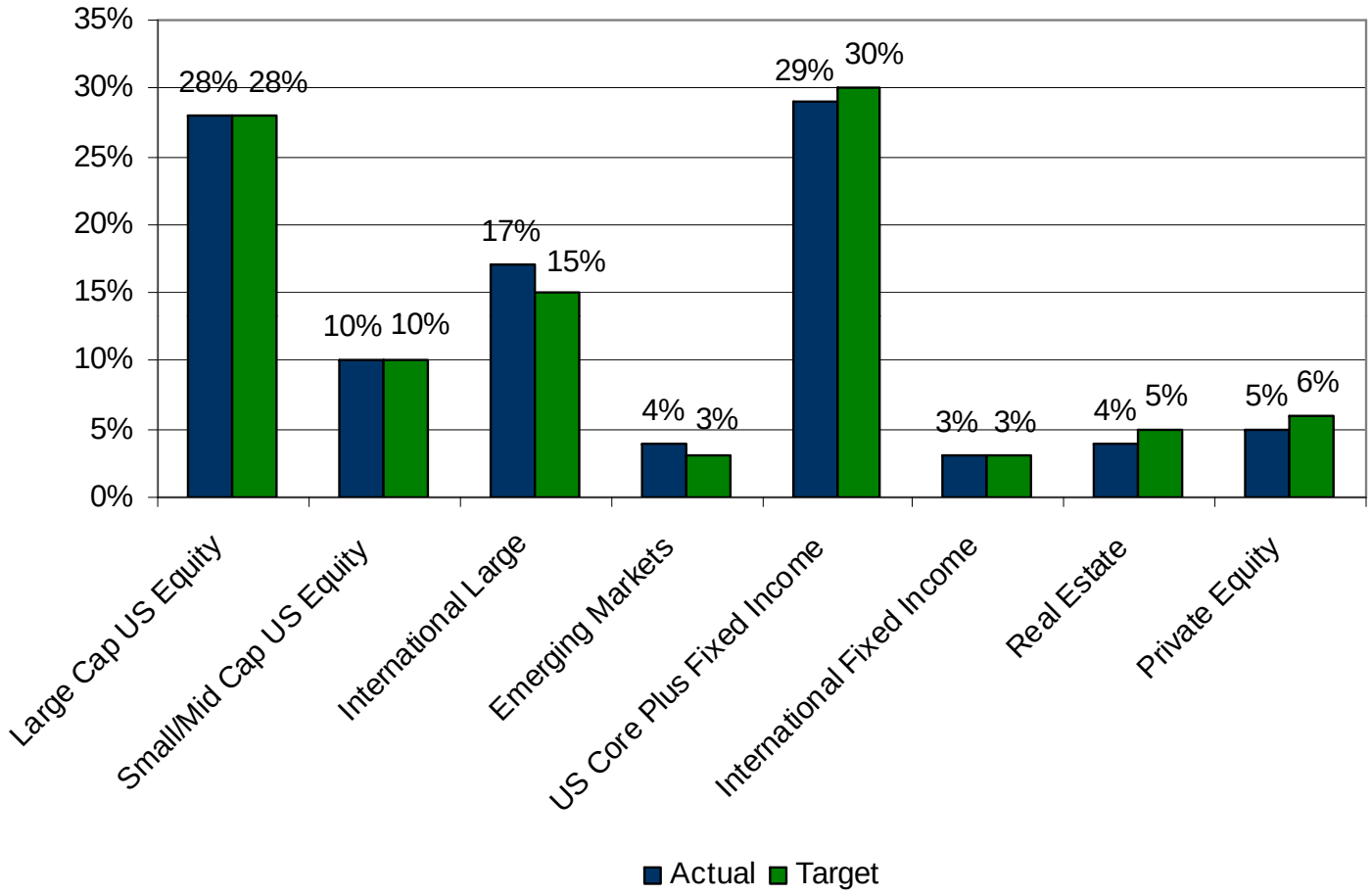
# Asset-Liability Modeling Process




After inputting the plan's liability information and return assumptions the modeling tool projects 2,000 independent scenarios.

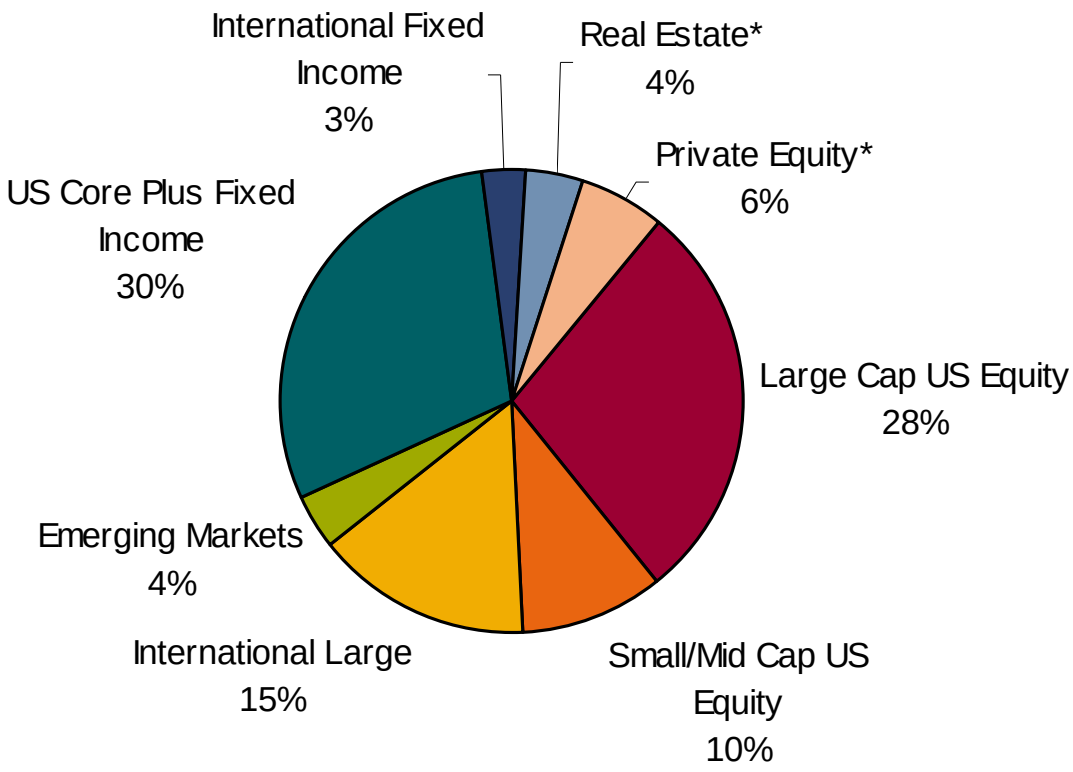
# *II. Plan Information*

# Target vs Actual Allocation
## As of 3/31/08




Note: Actual Allocation does not take into account future allocations to Private Equity and Real Estate

# Current Asset Allocation




**Market Value as of 3/31/08 ($000's):**

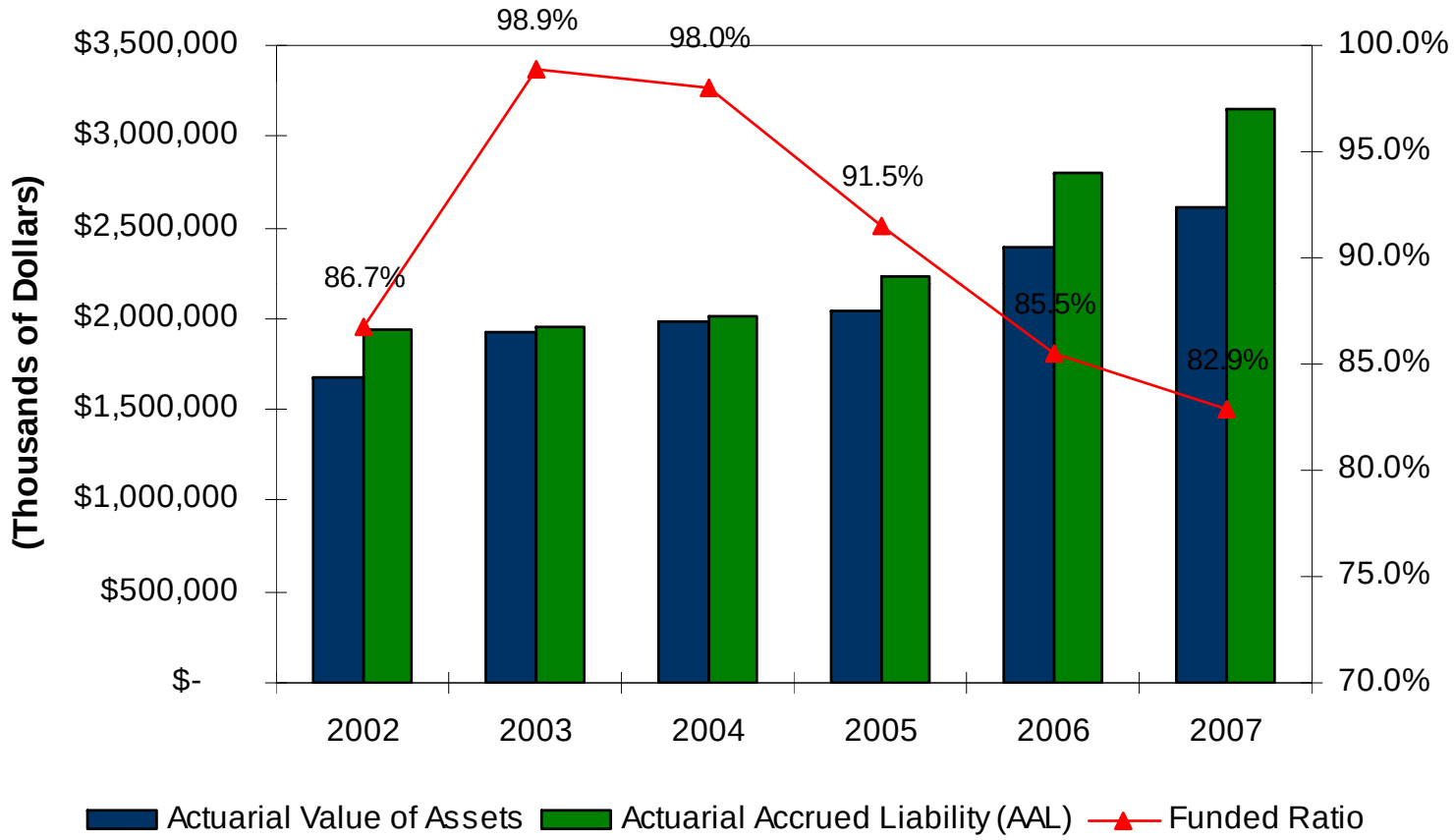
**$2,736,271**

*Yet to be Fully Funded

# Current Manager Structure
## As of 3/31/08

| Asset Class/Manager | Market Value ($MM) | % of Total Plan |
|---|---|---|
| **Large Cap Core** | | |
| SSGA Flagship | $ 171,228 | 6.3% |
| **Large Cap Growth** | | |
| INTECH | $ 152,322 | 5.6% |
| R1000G | $ 103,707 | 3.8% |
| **Large Cap Value** | | |
| AJO | $ 190,416 | 7.0% |
| Wellington | $ 168,884 | 6.2% |
| **Small Cap Growth** | | |
| Artisan | $ 60,427 | 2.2% |
| Kalmar | $ 64,783 | 2.4% |
| **Small Cap Value** | | |
| Brandywine | $ 127,347 | 4.7% |
| **International Equity** | | |
| Templeton | $ 231,261 | 8.5% |
| Oechsle | $ 165,866 | 6.1% |
| Modrian | $ 192,087 | 7.0% |
| **Core Plus Fixed Income** | | |
| Blackrock | $ 228,875 | 8.4% |
| Bradford | $ 188,032 | 6.9% |
| Loomis | $ 154,612 | 5.7% |
| WAMCO | $ 203,811 | 7.4% |
| **Global Fixed Income** | | |
| GMO | $ 81,821 | 3.0% |
| **Real Estate (Multiple)** | $ 100,828 | 3.7% |
| **Private Equity (Multiple)** | $ 127,159 | 4.6% |
| **Cash** | $ 22,805 | 0.8% |
| **Total** | $ 2,736,271 | 100.0% |

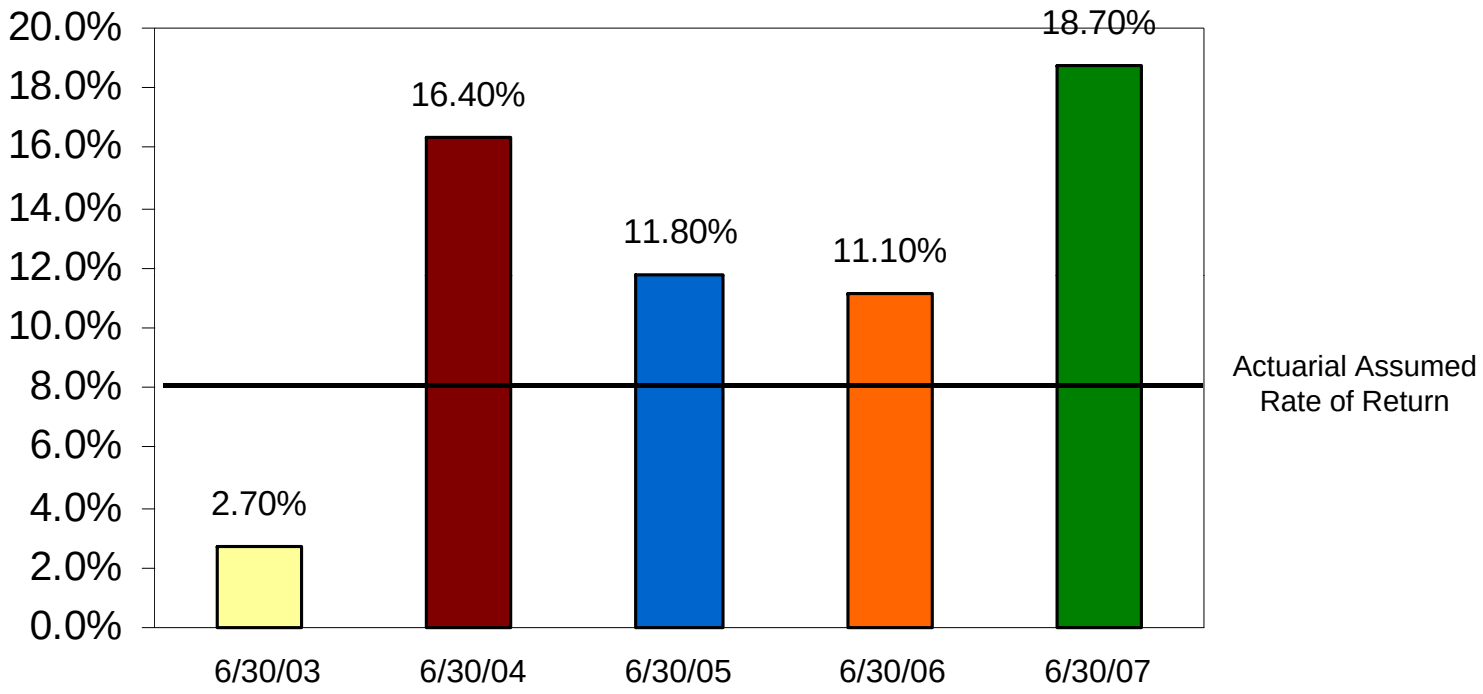
# Historical Funded Status




Source: Segal

# Investment Experience

## Actual Return vs Actuarial Assumed Rate




The actuarial assumed rate of return was changed from 8.16% to 8.00% as of the June 30, 2007 valuation report.

# *III. Asset Assumptions*

# Asset Class Selection

| Asset Class | Return Enhancement | Risk* Reduction |
|---|---|---|
| Large Cap U.S. Equity | ● | ○ |
| Small / Mid Cap U.S. Equity | ● | ○ |
| International Large Equity | ● | ◒ |
| International Small Equity | ● | ○ |
| Emerging Markets | ● | ○ |
| U.S. Core Plus Fixed Income | ○ | ● |
| Opportunistic Fixed Income | ◒ | ◒ |
| Global Fixed Income | ○ | ◒ |
| Real Estate | ◒ | ● |
| Liquid Alternatives / Hedge Funds | ◒ | ● |
| Private Equity / Venture Capital | ● | ○ |
| Real Assets | ◒ | ● |

● High Impact

◒ Moderate Impact

○ Low Impact

*Risk defined as standard deviation of returns

# Wurts' 2008 Expected Return & Risk Assumptions

| Asset Class | Index Proxy | Historical Returns (Period) | Long-Term Estimates | |
|---|---|---|---|---|
| | | | Annual Return | Standard Deviation |
| Large Cap U.S. Equity | S&P 500 | 10.4% (1926 - 2007) | 8.20% | 16.0% |
| Small/Mid Cap U.S. Equity | Ibbotson US Small Stock | 12.5% (1926 - 2007) | 8.50% | 22.0% |
| International Large | MSCI EAFE | 11.6% (1970 - 2007) | 8.70% | 19.0% |
| International Small | Citigroup EMI World ex US | 8.0% (1989 - 2007) | 8.90% | 23.0% |
| Emerging Markets | MSCI Emerging Markets | 16.3% (1988 - 2007) | 9.50% | 28.0% |
| U.S. Core Plus Fixed Income | Lehman Brothers Aggregate | 8.6% (1976 - 2007) | 5.25% | 6.0% |
| Opportunistic Fixed Income | Lehman Brothers High Yield | 8.8% (1986 - 2007) | 6.50% | 10.0% |
| Global Fixed Income | JP Morgan GBI Non-US Yield | 10.7% (1986 - 2007) | 4.0% | 5.0% |
| Liquid Alt/Hedge Funds | HFRI Fund of Funds | 9.9% (1990 - 2007) | 7.50% | 7.0% |
| Private Equity/Venture Capital | Cambridge PE / VC | 15.4% (1986 – Q3 2007) | 11.75% | 35.0% |
| Real Assets | DJ AIG Commodity | 7.9% (1991-2007) | 6.50% | 12.0% |
| Cash | Citigroup US Domestic 3M T-Bill | 6.2% (1978 - 2007) | 4.00% | 1.0% |
| Inflation | US Consumer Price Index | 3.1% (1926 - 2007) | 2.70% | 2.0% |

Source: Ibbotson, Hedge Fund Research, and Cambridge. Return observations are annual.

# Wurts' 2008 Correlation Assumptions

| | Large Cap Equity | SMid Cap Equity | Intl Large | Intl Small | Emg Mkts | US Core Plus F.I. | Global F.I. | Opportunistic F.I. | Liquid Alts/Hedge Funds | Private Equity/VC | Real Assets | Cash | US Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Large Cap Equity** | **1.00** | | | | | | | | | | | | |
| **SMid Cap Equity** | 0.81 | **1.00** | | | | | | | | | | | |
| **Intl Large** | 0.79 | 0.70 | **1.00** | | | | | | | | | | |
| **Intl Small** | 0.64 | 0.64 | 0.88 | **1.00** | | | | | | | | | |
| **Emg Mkts** | 0.68 | 0.68 | 0.74 | 0.78 | **1.00** | | | | | | | | |
| **US Core F.I.** | 0.05 | -0.04 | -0.04 | -0.06 | -0.08 | **1.00** | | | | | | | |
| **Global F.I.** | 0.01 | -0.05 | -0.05 | -0.19 | -0.10 | 0.63 | **1.00** | | | | | | |
| **Opportunistic F.I.** | 0.48 | 0.50 | 0.38 | 0.44 | 0.38 | 0.20 | 0.10 | **1.00** | | | | | |
| **Liquid Alts/Hedge Funds** | 0.55 | 0.58 | 0.60 | 0.62 | 0.69 | 0.06 | 0.00 | -0.02 | **1.00** | | | | |
| **Private Equity/VC** | 0.65 | 0.55 | 0.52 | 0.42 | 0.43 | -0.22 | -0.04 | 0.05 | 0.55 | **1.00** | | | |
| **Real Assets** | 0.04 | 0.19 | 0.19 | 0.30 | 0.25 | 0.06 | 0.00 | 0.20 | 0.29 | 0.03 | **1.00** | | |
| **Cash** | 0.05 | -0.08 | -0.13 | -0.14 | -0.10 | 0.67 | 0.21 | -0.07 | 0.03 | 0.00 | -0.01 | **1.00** | |
| **US Inflation** | -0.11 | -0.19 | -0.20 | -0.05 | -0.10 | -0.12 | -0.10 | -0.01 | -0.04 | -0.09 | 0.20 | 0.07 | **1.00** |

*Note: Correlation assumptions are based on both historical observations and Wurts estimate of future correlation trends.*

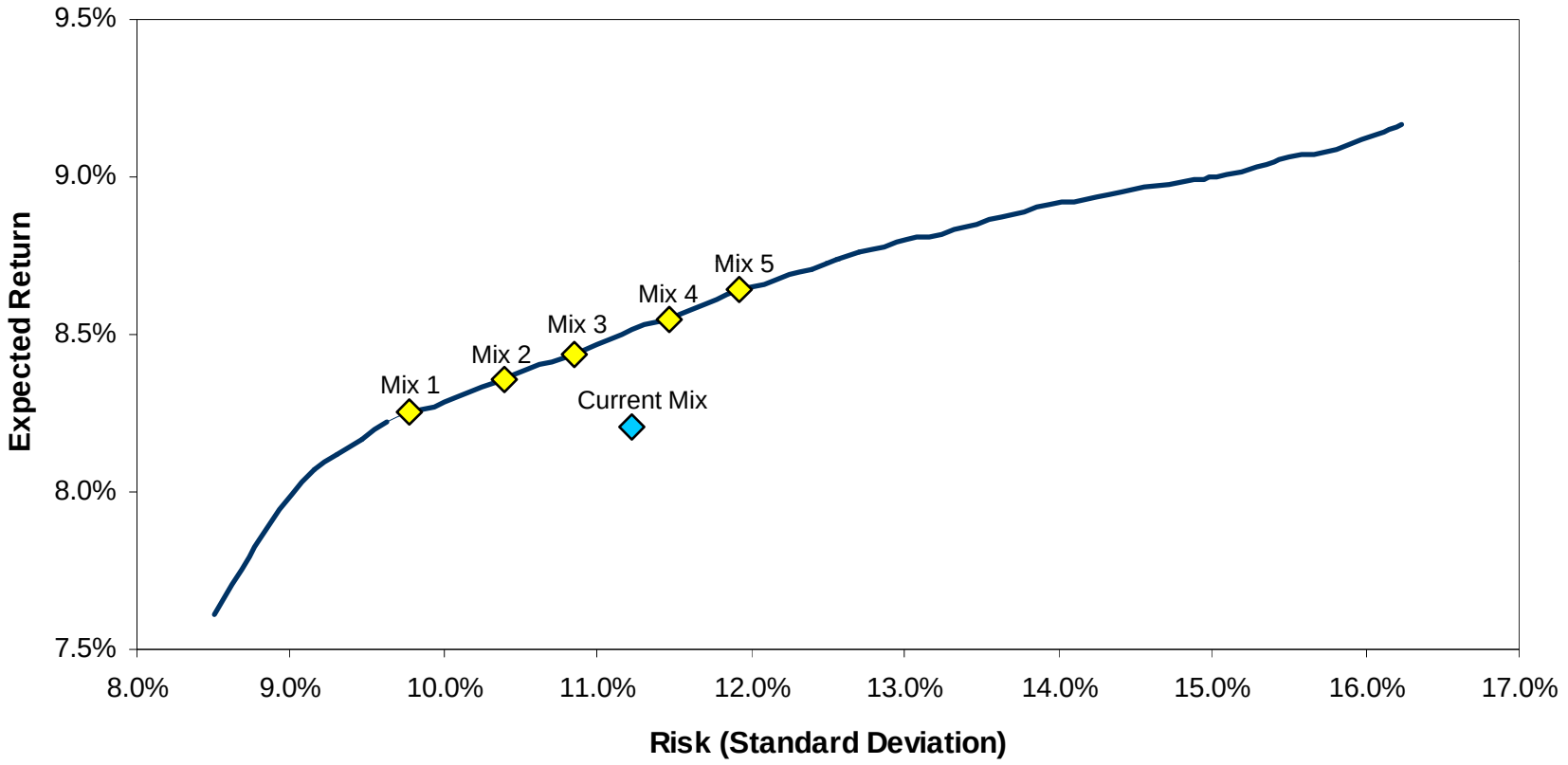
# *IV. Efficient Portfolio Mixes*

# Efficient Frontier Constraints

| Constraint | Minimum | Maximum |
|---|---|---|
| Total Int'l. Equity Allocation of Total Equity Allocation | 25% | 35% |
| Emerging Markets of Total Int'l. Allocation | 10% | 20% |
| Small Cap U.S. of Total Domestic Allocation | 20% | 30% |
| Opportunistic FI of Total FI | 0% | 33% |
| Real Assets of Total Plan Allocation | 0% | 15% |
| Liquid Alts/Hedge Funds of Total Plan Allocation | 0% | 10% |
| Private Equity/Venture Capital of Total Plan Allocation | 0% | 8% |

- Constraints are placed upon the Mean-Variance model in order to create asset mixes that are acceptable from a qualitative perspective
- Please refer to appendix for further details on constraints

# Efficient Frontier




All alternative mixes are more efficient than the current asset allocation mix.

# Efficient Portfolio Mixes

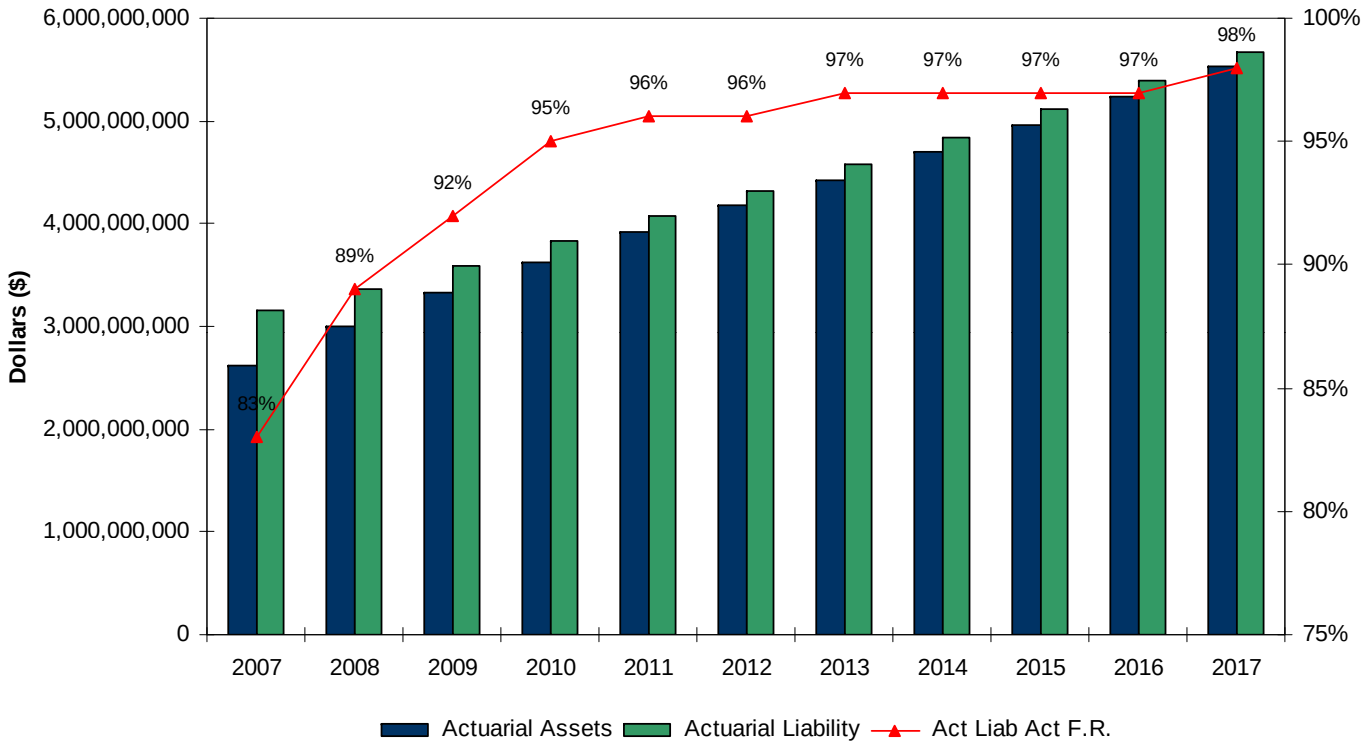
| | Current | Mix 1 | Mix 2 | Mix 3 | Mix 4 | Mix 5 |
|---|---|---|---|---|---|---|
| Large Cap US Equity | 28% | 19.0% | 20.4% | 22.0% | 23.7% | 25.0% |
| Small/Mid Cap US Equity | 10% | 6.4% | 7.0% | 7.4% | 8.0% | 8.5% |
| International Large Equity | 15% | 9.8% | 10.7% | 11.3% | 12.2% | 12.8% |
| International Small Equity | 0% | 5.1% | 5.7% | 6.0% | 6.5% | 6.8% |
| Emerging Markets | 4% | 1.5% | 1.7% | 1.8% | 2.0% | 2.1% |
| US Core Plus Fixed Income | 30% | 22.0% | 19.2% | 17.1% | 13.8% | 11.2% |
| Opportunistic Fixed Income | 0% | 5.6% | 5.9% | 5.9% | 5.9% | 5.9% |
| Global Fixed Income | 3% | 1.2% | 1.2% | 1.1% | 1.1% | 1.1% |
| Liquid Alt./ Hedge Funds | 0% | 9.8% | 9.3% | 9.0% | 8.7% | 8.6% |
| Private Equity/Venture Capital | 6% | 6.9% | 7.0% | 7.0% | 7.1% | 7.1% |
| Real Assets | 4.0% | 12.7% | 11.9% | 11.4% | 11.0% | 10.9% |
| | | | | | | |
| Expected Return | 8.21% | 8.25% | 8.36% | 8.44% | 8.55% | 8.64% |
| Standard Deviation | 11.23% | 9.77% | 10.39% | 10.85% | 11.47% | 11.93% |
| Sharpe Ratio | 0.375 | 0.435 | 0.420 | 0.409 | 0.397 | 0.389 |

Real Assets include Real Estate, Infrastructure, and Commodities.

Note: Current Allocation takes into account future allocations to Private Equity and Real Estate

# *V. Deterministic Projection*

# Deterministic Projection
## Funded Status

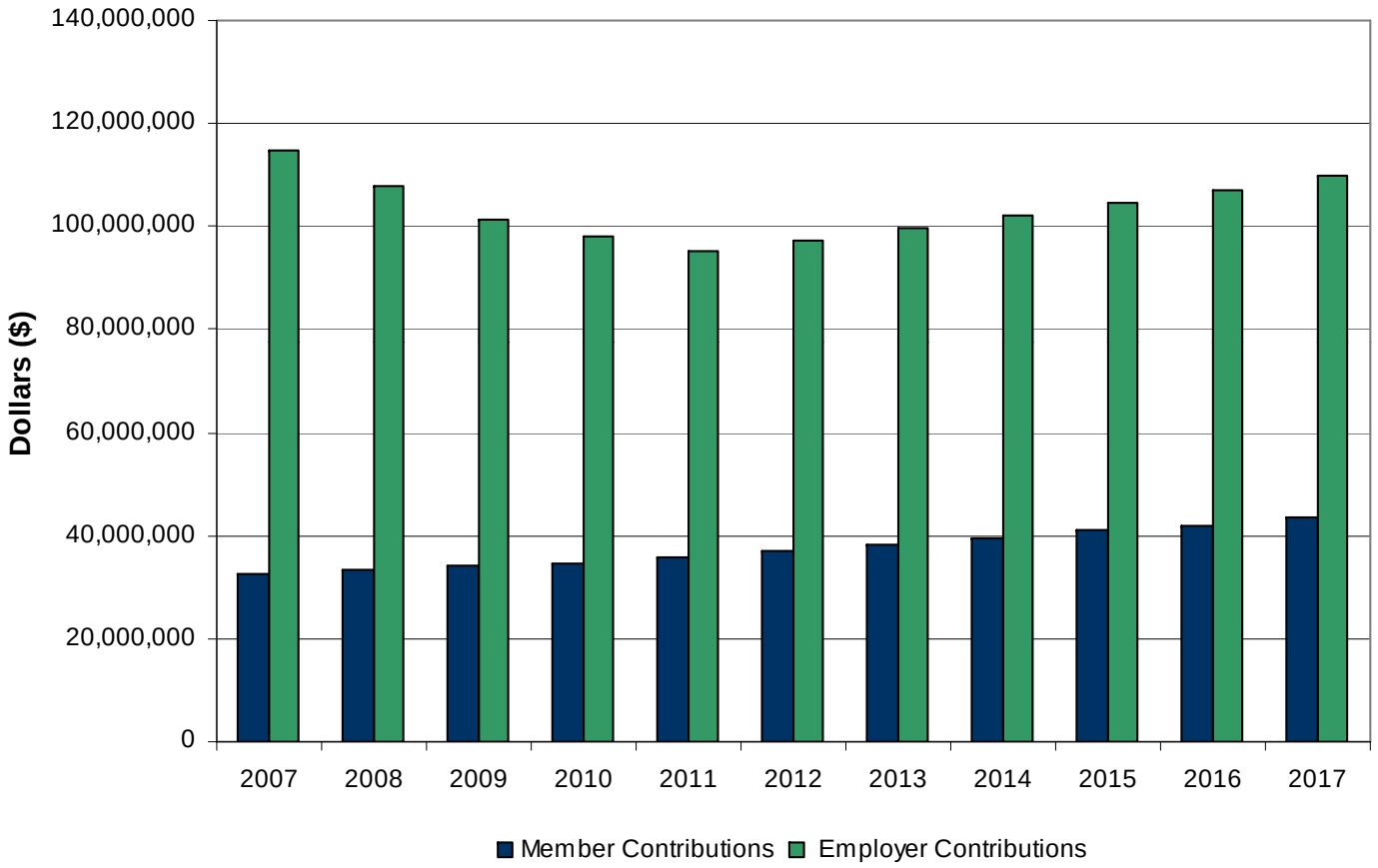



The Deterministic Scenario assumes all actuarial assumptions are attained: 8.00% rate of return, 3.75% inflation, salary increases, demographics, etc.

Note: Fiscal Years Used

# Deterministic Projection

## Employer & Member Contributions




The Deterministic Scenario assumes all actuarial assumptions are attained: 8.00% rate of return, 3.75% inflation, salary increases, demographics, etc.

Note: Fiscal Years Used

# *VI. Stochastic Projections*

# Stochastic Case: Compound Returns

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 29.8% | 23.1% | 19.9% | 18.1% | 17.4% | 16.3% | 15.7% | 15.3% | 14.8% | 14.6% | 14.4% |
| **25th: Optimistic** | 16.3% | 14.0% | 12.9% | 12.3% | 11.8% | 11.7% | 11.3% | 11.2% | 10.9% | 10.7% | 10.6% |
| **50th: Most Probable** | 8.1% | 7.9% | 8.2% | 8.0% | 8.2% | 8.2% | 8.3% | 8.2% | 8.2% | 8.2% | 8.2% |
| **75th: Pessimistic** | 0.2% | 2.5% | 3.4% | 4.1% | 4.7% | 5.0% | 5.2% | 5.5% | 5.6% | 5.7% | 5.8% |
| **95th: Worst Case** | -10.1% | -5.1% | -2.6% | -0.8% | 0.1% | 0.5% | 1.2% | 1.8% | 2.2% | 2.5% | 2.7% |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 27.3% | 21.1% | 18.8% | 17.0% | 16.2% | 15.6% | 14.8% | 14.4% | 14.1% | 13.9% | 13.5% |
| **25th: Optimistic** | 15.5% | 13.3% | 12.5% | 12.0% | 11.6% | 11.3% | 11.1% | 10.9% | 10.7% | 10.5% | 10.4% |
| **50th: Most Probable** | 8.0% | 8.0% | 8.2% | 8.2% | 8.3% | 8.3% | 8.4% | 8.3% | 8.3% | 8.2% | 8.2% |
| **75th: Pessimistic** | 1.3% | 3.4% | 4.1% | 4.8% | 5.2% | 5.3% | 5.6% | 5.8% | 5.9% | 6.1% | 6.1% |
| **95th: Worst Case** | -8.0% | -3.3% | -1.4% | 0.1% | 0.9% | 1.3% | 2.0% | 2.6% | 2.9% | 3.0% | 3.2% |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 28.7% | 21.9% | 19.5% | 17.7% | 16.8% | 16.2% | 15.3% | 14.9% | 14.6% | 14.4% | 13.9% |
| **25th: Optimistic** | 16.0% | 13.7% | 12.9% | 12.3% | 12.0% | 11.6% | 11.4% | 11.2% | 10.9% | 10.8% | 10.7% |
| **50th: Most Probable** | 8.1% | 8.1% | 8.3% | 8.3% | 8.4% | 8.4% | 8.6% | 8.4% | 8.4% | 8.4% | 8.4% |
| **75th: Pessimistic** | 1.1% | 3.2% | 4.0% | 4.7% | 5.2% | 5.4% | 5.6% | 5.8% | 5.9% | 6.1% | 6.1% |
| **95th: Worst Case** | -8.9% | -3.9% | -1.8% | -0.1% | 0.6% | 1.1% | 1.8% | 2.5% | 2.8% | 2.9% | 3.1% |

All mixes are projected to satisfy the 8.0% actuarial assumed rate of return.

# Stochastic Case: Compound Returns

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 29.7% | 22.6% | 20.0% | 18.2% | 17.3% | 16.6% | 15.6% | 15.3% | 14.9% | 14.8% | 14.3% |
| **25th: Optimistic** | 16.4% | 14.1% | 13.1% | 12.6% | 12.2% | 11.9% | 11.6% | 11.4% | 11.2% | 11.0% | 10.9% |
| **50th: Most Probable** | 8.2% | 8.2% | 8.4% | 8.5% | 8.5% | 8.5% | 8.7% | 8.6% | 8.5% | 8.5% | 8.5% |
| **75th: Pessimistic** | 0.8% | 3.0% | 3.9% | 4.6% | 5.2% | 5.4% | 5.6% | 5.9% | 5.9% | 6.1% | 6.1% |
| **95th: Worst Case** | -9.5% | -4.3% | -2.1% | -0.2% | 0.4% | 0.9% | 1.7% | 2.3% | 2.6% | 2.8% | 3.0% |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 30.8% | 23.5% | 20.8% | 19.0% | 18.0% | 17.1% | 16.3% | 15.9% | 15.4% | 15.4% | 14.8% |
| **25th: Optimistic** | 17.1% | 14.6% | 13.5% | 13.0% | 12.4% | 12.2% | 11.9% | 11.7% | 11.5% | 11.3% | 11.2% |
| **50th: Most Probable** | 8.4% | 8.4% | 8.6% | 8.6% | 8.7% | 8.7% | 8.9% | 8.7% | 8.7% | 8.7% | 8.6% |
| **75th: Pessimistic** | 0.5% | 2.9% | 3.8% | 4.6% | 5.2% | 5.4% | 5.6% | 5.9% | 5.9% | 6.2% | 6.2% |
| **95th: Worst Case** | -10.4% | -4.8% | -2.5% | -0.6% | 0.2% | 0.7% | 1.5% | 2.1% | 2.6% | 2.7% | 2.8% |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 32.0% | 24.5% | 21.6% | 19.6% | 18.4% | 17.6% | 16.7% | 16.3% | 15.9% | 15.7% | 15.1% |
| **25th: Optimistic** | 17.5% | 14.9% | 13.8% | 13.3% | 12.7% | 12.5% | 12.2% | 12.0% | 11.7% | 11.5% | 11.4% |
| **50th: Most Probable** | 8.6% | 8.5% | 8.7% | 8.7% | 8.8% | 8.8% | 9.0% | 8.9% | 8.8% | 8.8% | 8.7% |
| **75th: Pessimistic** | 0.4% | 2.8% | 3.7% | 4.5% | 5.2% | 5.4% | 5.5% | 5.9% | 6.0% | 6.2% | 6.2% |
| **95th: Worst Case** | -10.9% | -5.1% | -2.8% | -0.9% | 0.0% | 0.4% | 1.3% | 1.9% | 2.4% | 2.6% | 2.8% |

Projected Surplus in 2017 increases with the higher expected returns in the more aggressive portfolios.

# Projected Unfunded Actuarial Accrued Liability (UAAL)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 212.5 | -113.8 | -472.6 | -846.5 | -1207.9 | -1593.2 | -1990.2 | -2429.8 | -2906.9 | -3334.8 |
| **25th: Optimistic** | 539.3 | 303.8 | 101.5 | -71.1 | -270.7 | -417.8 | -572.8 | -696.2 | -845.0 | -997.6 | -1153.4 |
| **50th: Most Probable** | 539.3 | 355.2 | 239.6 | 150.1 | 72.0 | 42.5 | 14.1 | -8.0 | -51.1 | -86.0 | -84.9 |
| **75th: Pessimistic** | 539.3 | 403.6 | 360.5 | 362.5 | 396.2 | 462.4 | 513.9 | 558.2 | 593.1 | 661.4 | 667.5 |
| **95th: Worst Case** | 539.3 | 468.2 | 529.1 | 640.7 | 786.6 | 987.1 | 1139.9 | 1210.4 | 1337.6 | 1440.9 | 1536.5 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 238.1 | -57.8 | -381.5 | -694.7 | -988.1 | -1320.5 | -1676.0 | -1973.1 | -2390.9 | -2800.9 |
| **25th: Optimistic** | 539.3 | 308.8 | 119.3 | -48.3 | -229.3 | -364.0 | -481.5 | -625.2 | -742.3 | -895.9 | -997.5 |
| **50th: Most Probable** | 539.3 | 356.1 | 237.9 | 149.5 | 66.2 | 30.2 | 14.0 | -33.5 | -84.0 | -98.2 | -103.5 |
| **75th: Pessimistic** | 539.3 | 397.4 | 342.5 | 334.7 | 344.2 | 405.0 | 445.2 | 488.3 | 524.5 | 568.4 | 579.6 |
| **95th: Worst Case** | 539.3 | 454.4 | 488.8 | 564.1 | 687.3 | 880.4 | 1009.7 | 1087.8 | 1166.3 | 1234.9 | 1342.8 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 229.1 | -82.8 | -423.3 | -763.3 | -1086.5 | -1470.2 | -1850.6 | -2197.6 | -2644.5 | -3103.8 |
| **25th: Optimistic** | 539.3 | 304.8 | 109.9 | -65.5 | -259.0 | -409.3 | -535.5 | -692.3 | -823.2 | -997.3 | -1142.7 |
| **50th: Most Probable** | 539.3 | 355.1 | 235.0 | 141.4 | 53.4 | 8.4 | -14.9 | -59.8 | -123.1 | -154.6 | -161.3 |
| **75th: Pessimistic** | 539.3 | 399.0 | 346.1 | 339.5 | 349.8 | 414.4 | 444.0 | 495.6 | 517.2 | 561.0 | 568.9 |
| **95th: Worst Case** | 539.3 | 457.8 | 499.9 | 586.9 | 707.5 | 912.5 | 1040.9 | 1124.2 | 1209.7 | 1274.5 | 1373.9 |

The Present Value of Total Contributions in 2017 progressively decreases with the higher expected returns in the more aggressive portfolios.

Note: Millions ($), Fiscal Years Used

# Projected Unfunded Actuarial Accrued Liability (UAAL)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 219.5 | -104.5 | -449.5 | -824.7 | -1170.1 | -1579.0 | -1991.1 | -2394.0 | -2879.2 | -3368.3 |
| **25th: Optimistic** | 539.3 | 301.9 | 102.3 | -81.1 | -280.6 | -441.8 | -584.9 | -729.8 | -895.4 | -1078.1 | -1263.9 |
| **50th: Most Probable** | 539.3 | 354.0 | 233.2 | 132.0 | 43.6 | -3.8 | -29.7 | -81.6 | -143.4 | -193.0 | -207.4 |
| **75th: Pessimistic** | 539.3 | 400.5 | 348.4 | 343.7 | 353.9 | 420.2 | 446.1 | 496.0 | 514.2 | 556.5 | 575.6 |
| **95th: Worst Case** | 539.3 | 462.5 | 509.6 | 604.7 | 727.5 | 933.3 | 1075.7 | 1154.7 | 1240.5 | 1307.3 | 1418.7 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 210.0 | -140.1 | -495.2 | -903.9 | -1290.3 | -1760.6 | -2199.2 | -2660.0 | -3198.4 | -3752.1 |
| **25th: Optimistic** | 539.3 | 298.7 | 88.5 | -100.9 | -314.3 | -493.1 | -665.3 | -827.9 | -1013.6 | -1226.1 | -1431.1 |
| **50th: Most Probable** | 539.3 | 353.3 | 229.8 | 122.9 | 32.1 | -22.1 | -60.2 | -114.1 | -195.3 | -242.9 | -268.9 |
| **75th: Pessimistic** | 539.3 | 401.9 | 351.3 | 351.4 | 362.0 | 425.5 | 454.4 | 492.2 | 513.5 | 548.9 | 566.9 |
| **95th: Worst Case** | 539.3 | 467.1 | 522.5 | 631.4 | 758.0 | 986.7 | 1118.7 | 1211.2 | 1281.1 | 1350.3 | 1462.0 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 539.3 | 198.3 | -165.9 | -531.5 | -963.3 | -1370.5 | -1876.7 | -2355.0 | -2804.3 | -3410.5 | -4059.8 |
| **25th: Optimistic** | 539.3 | 295.5 | 78.0 | -117.2 | -338.0 | -527.8 | -718.6 | -908.3 | -1094.7 | -1326.4 | -1529.5 |
| **50th: Most Probable** | 539.3 | 352.5 | 227.7 | 118.0 | 20.6 | -37.6 | -76.4 | -148.6 | -218.4 | -277.6 | -317.0 |
| **75th: Pessimistic** | 539.3 | 402.9 | 354.2 | 356.8 | 370.1 | 432.8 | 455.5 | 493.0 | 509.0 | 551.7 | 565.4 |
| **95th: Worst Case** | 539.3 | 470.5 | 531.4 | 647.4 | 777.1 | 1011.1 | 1137.1 | 1244.5 | 1309.3 | 1387.0 | 1494.9 |

Note: Millions ($), Fiscal Years Used

# Projected Funded Ratios

## Actuarial Assets/Actuarial Liabilities (%)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.6 | 103.2 | 112.6 | 121.3 | 128.6 | 135.9 | 142.6 | 149.2 | 156.7 | 162.2 |
| **25th: Optimistic** | 82.9 | 90.9 | 97.1 | 101.9 | 106.7 | 109.8 | 112.8 | 115.0 | 117.1 | 119.4 | 121.5 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.3 | 96.0 | 98.2 | 99.0 | 99.7 | 100.2 | 101.0 | 101.6 | 101.5 |
| **75th: Pessimistic** | 82.9 | 88.0 | 89.9 | 90.4 | 90.1 | 89.1 | 88.4 | 87.9 | 87.7 | 87.3 | 87.6 |
| **95th: Worst Case** | 82.9 | 86.1 | 85.2 | 83.0 | 80.6 | 76.8 | 74.6 | 74.2 | 73.0 | 71.9 | 71.6 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 92.9 | 101.6 | 110.0 | 117.4 | 123.2 | 130.0 | 135.6 | 140.6 | 146.7 | 151.7 |
| **25th: Optimistic** | 82.9 | 90.8 | 96.7 | 101.3 | 105.7 | 108.7 | 110.8 | 113.4 | 115.0 | 117.4 | 118.8 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.3 | 96.0 | 98.3 | 99.2 | 99.7 | 100.7 | 101.7 | 101.9 | 101.9 |
| **75th: Pessimistic** | 82.9 | 88.1 | 90.4 | 91.1 | 91.4 | 90.4 | 90.0 | 89.6 | 89.2 | 89.1 | 89.2 |
| **95th: Worst Case** | 82.9 | 86.5 | 86.4 | 85.1 | 82.9 | 79.5 | 77.6 | 76.4 | 75.8 | 75.9 | 75.3 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.2 | 102.3 | 111.1 | 119.4 | 125.6 | 132.9 | 139.6 | 145.0 | 152.4 | 157.8 |
| **25th: Optimistic** | 82.9 | 90.9 | 96.9 | 101.7 | 106.5 | 109.7 | 112.0 | 114.9 | 116.9 | 119.6 | 121.7 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.4 | 96.3 | 98.6 | 99.8 | 100.3 | 101.3 | 102.6 | 103.1 | 103.0 |
| **75th: Pessimistic** | 82.9 | 88.1 | 90.3 | 90.9 | 91.2 | 90.2 | 89.8 | 89.4 | 89.4 | 89.1 | 89.2 |
| **95th: Worst Case** | 82.9 | 86.4 | 86.1 | 84.5 | 82.3 | 78.6 | 76.6 | 75.7 | 75.3 | 74.7 | 74.7 |

Note: Fiscal Years Used

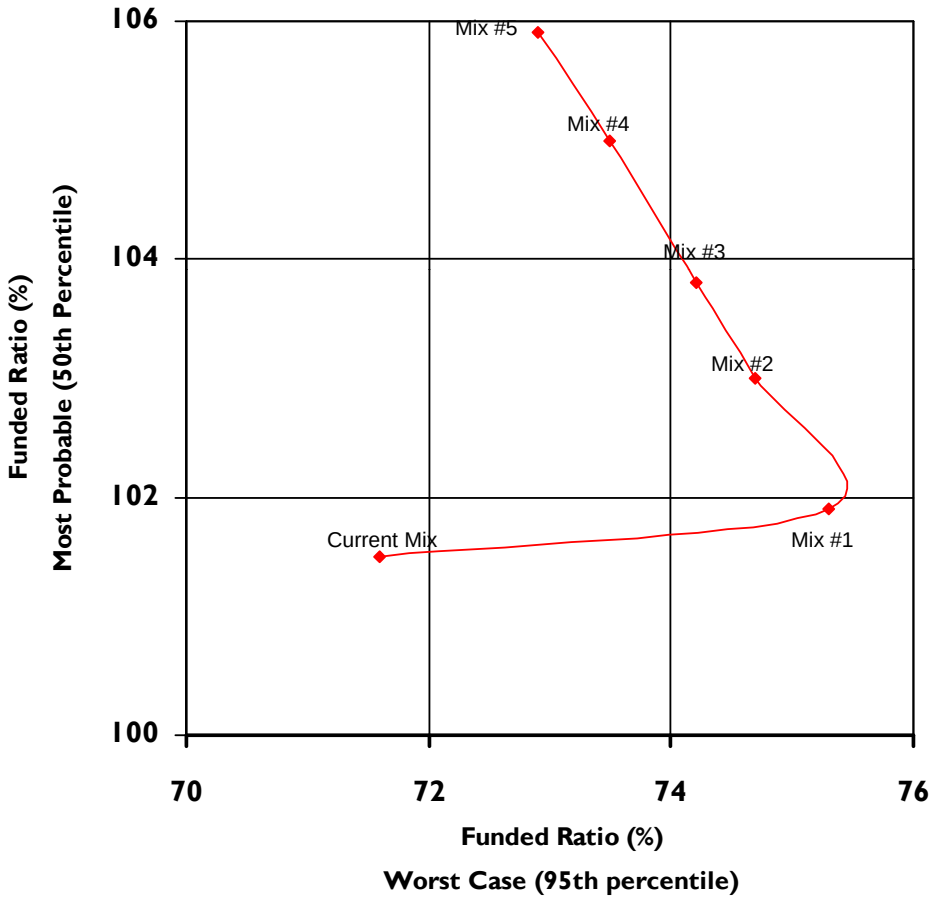
# Projected Funded Ratios

## Actuarial Assets/Actuarial Liabilities (%)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.4 | 102.9 | 111.9 | 120.8 | 127.4 | 135.8 | 142.6 | 148.8 | 156.3 | 162.6 |
| **25th: Optimistic** | 82.9 | 91.0 | 97.1 | 102.1 | 107.0 | 110.5 | 113.1 | 115.7 | 118.1 | 121.2 | 123.6 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.4 | 96.5 | 98.9 | 100.1 | 100.7 | 101.7 | 103.0 | 103.8 | 103.8 |
| **75th: Pessimistic** | 82.9 | 88.1 | 90.2 | 90.9 | 91.1 | 90.0 | 89.7 | 89.2 | 89.5 | 89.1 | 89.1 |
| **95th: Worst Case** | 82.9 | 86.3 | 85.8 | 84.0 | 81.8 | 78.0 | 76.1 | 75.1 | 74.7 | 73.9 | 74.2 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.7 | 103.9 | 113.3 | 122.8 | 130.1 | 139.6 | 147.0 | 154.4 | 161.9 | 169.7 |
| **25th: Optimistic** | 82.9 | 91.1 | 97.5 | 102.7 | 107.9 | 111.5 | 114.8 | 117.7 | 120.7 | 123.7 | 126.4 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.6 | 96.7 | 99.2 | 100.5 | 101.3 | 102.4 | 103.8 | 104.7 | 105.0 |
| **75th: Pessimistic** | 82.9 | 88.0 | 90.2 | 90.7 | 90.8 | 89.9 | 89.6 | 89.1 | 89.5 | 89.4 | 89.2 |
| **95th: Worst Case** | 82.9 | 86.2 | 85.5 | 83.4 | 81.2 | 77.0 | 75.2 | 74.1 | 74.1 | 73.5 | 73.5 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 94.0 | 104.6 | 114.2 | 124.3 | 132.3 | 142.0 | 150.1 | 158.1 | 166.4 | 174.9 |
| **25th: Optimistic** | 82.9 | 91.2 | 97.8 | 103.1 | 108.5 | 112.4 | 116.0 | 119.2 | 122.6 | 125.5 | 128.6 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.6 | 96.9 | 99.5 | 100.9 | 101.7 | 103.1 | 104.4 | 105.3 | 105.9 |
| **75th: Pessimistic** | 82.9 | 88.0 | 90.1 | 90.7 | 90.7 | 89.8 | 89.5 | 89.3 | 89.3 | 89.5 | 89.3 |
| **95th: Worst Case** | 82.9 | 86.0 | 85.2 | 83.0 | 80.7 | 76.3 | 74.5 | 73.6 | 73.5 | 73.3 | 72.9 |

Note: Fiscal Years Used

# 2017 Projected Funded Ratio Comparison



# Total Contributions
## Employer + Member

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 124.2 | 95.3 | 62.9 | 34.9 | 33.9 | 33.8 | 34.0 | 33.9 | 33.8 | 34.4 |
| **25th: Optimistic** | 152.2 | 133.0 | 116.9 | 101.2 | 84.8 | 71.1 | 57.5 | 45.7 | 41.9 | 41.7 | 41.8 |
| **50th: Most Probable** | 152.2 | 138.6 | 130.9 | 124.8 | 118.4 | 116.9 | 115.5 | 115.4 | 113.1 | 109.8 | 112.4 |
| **75th: Pessimistic** | 152.2 | 144.0 | 142.7 | 145.7 | 150.6 | 160.4 | 170.2 | 174.8 | 183.9 | 193.4 | 199.8 |
| **95th: Worst Case** | 152.2 | 151.6 | 161.8 | 176.1 | 191.3 | 214.7 | 234.5 | 250.5 | 268.4 | 284.9 | 302.0 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 126.2 | 100.4 | 72.4 | 41.2 | 34.6 | 34.5 | 34.6 | 34.4 | 34.4 | 34.8 |
| **25th: Optimistic** | 152.2 | 133.7 | 118.7 | 104.0 | 89.1 | 77.2 | 67.5 | 53.7 | 45.0 | 43.4 | 42.9 |
| **50th: Most Probable** | 152.2 | 138.8 | 130.4 | 124.0 | 118.0 | 116.4 | 115.2 | 113.5 | 110.6 | 107.0 | 107.7 |
| **75th: Pessimistic** | 152.2 | 143.4 | 140.9 | 143.0 | 145.4 | 153.6 | 161.1 | 167.2 | 175.4 | 183.6 | 189.1 |
| **95th: Worst Case** | 152.2 | 149.9 | 157.2 | 167.3 | 181.8 | 204.2 | 221.5 | 236.7 | 251.4 | 265.1 | 277.5 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 125.4 | 98.2 | 67.5 | 36.4 | 34.2 | 34.2 | 34.3 | 34.1 | 34.3 | 34.6 |
| **25th: Optimistic** | 152.2 | 133.4 | 117.6 | 102.1 | 86.2 | 72.9 | 60.9 | 45.9 | 42.7 | 42.1 | 41.9 |
| **50th: Most Probable** | 152.2 | 138.7 | 130.3 | 123.5 | 116.8 | 114.3 | 112.6 | 109.8 | 105.4 | 102.5 | 101.4 |
| **75th: Pessimistic** | 152.2 | 143.5 | 141.2 | 143.5 | 145.9 | 154.4 | 161.2 | 167.6 | 175.4 | 183.0 | 188.6 |
| **95th: Worst Case** | 152.2 | 150.3 | 158.5 | 169.1 | 184.6 | 207.2 | 224.2 | 241.0 | 255.2 | 269.3 | 280.9 |

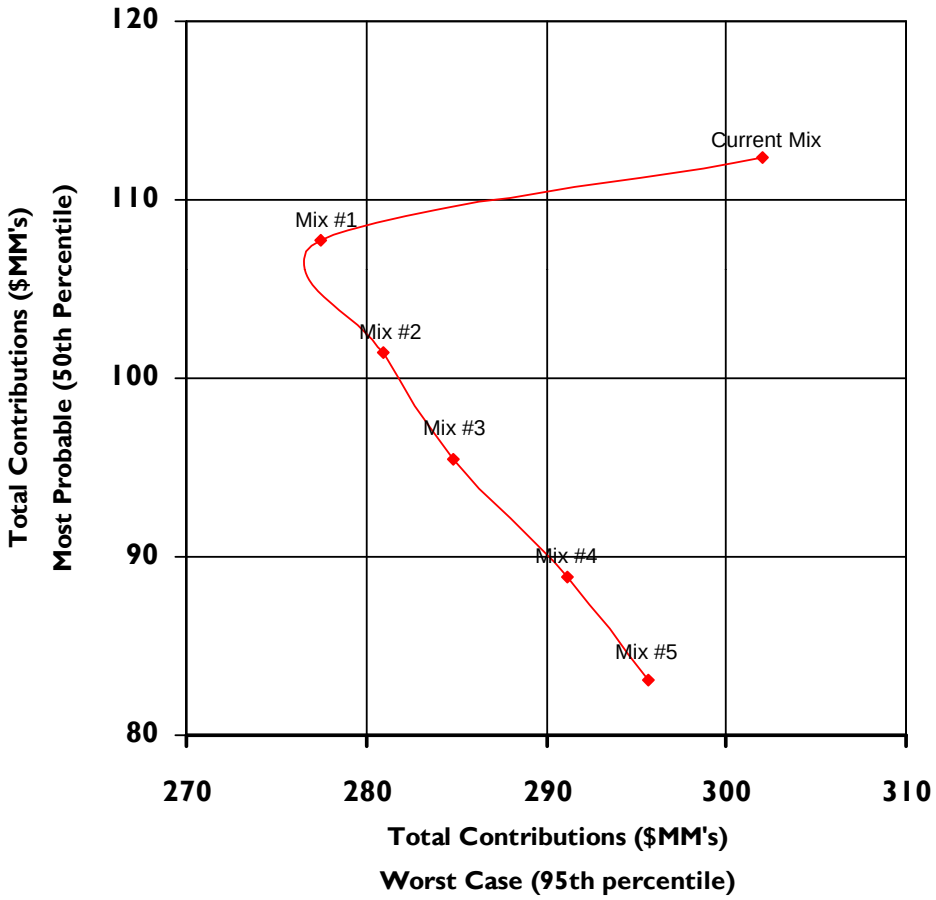
Note: Millions ($), Fiscal Years Used

# Total Contributions
## Employer + Member

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 124.7 | 96.5 | 63.7 | 35.3 | 34.1 | 34.0 | 34.1 | 34.0 | 34.0 | 34.4 |
| **25th: Optimistic** | 152.2 | 133.1 | 116.8 | 100.6 | 83.5 | 69.6 | 55.9 | 43.6 | 41.5 | 41.2 | 41.4 |
| **50th: Most Probable** | 152.2 | 138.7 | 130.3 | 122.9 | 115.9 | 113.0 | 110.4 | 107.4 | 101.8 | 98.5 | 95.5 |
| **75th: Pessimistic** | 152.2 | 143.6 | 141.4 | 143.7 | 146.6 | 155.1 | 161.2 | 167.7 | 174.4 | 183.2 | 188.7 |
| **95th: Worst Case** | 152.2 | 150.6 | 159.5 | 170.9 | 186.4 | 209.2 | 227.0 | 243.8 | 260.6 | 274.4 | 284.8 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 123.7 | 93.6 | 58.6 | 34.4 | 33.6 | 33.7 | 33.9 | 33.9 | 33.8 | 34.1 |
| **25th: Optimistic** | 152.2 | 132.9 | 115.7 | 98.7 | 80.1 | 64.9 | 48.3 | 41.4 | 40.7 | 40.3 | 40.6 |
| **50th: Most Probable** | 152.2 | 138.6 | 130.1 | 122.2 | 114.8 | 110.8 | 108.4 | 104.4 | 97.7 | 92.3 | 88.9 |
| **75th: Pessimistic** | 152.2 | 143.7 | 141.7 | 144.0 | 147.0 | 155.5 | 161.3 | 168.0 | 174.4 | 182.6 | 187.6 |
| **95th: Worst Case** | 152.2 | 151.0 | 160.5 | 173.4 | 189.8 | 212.7 | 230.8 | 248.6 | 265.8 | 276.7 | 291.2 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 122.9 | 90.8 | 55.0 | 33.9 | 33.4 | 33.7 | 33.8 | 33.6 | 33.5 | 33.8 |
| **25th: Optimistic** | 152.2 | 132.6 | 114.8 | 97.1 | 77.4 | 61.0 | 43.6 | 40.5 | 39.9 | 39.8 | 40.2 |
| **50th: Most Probable** | 152.2 | 138.5 | 129.7 | 121.5 | 113.7 | 109.6 | 106.3 | 102.4 | 94.9 | 87.5 | 83.1 |
| **75th: Pessimistic** | 152.2 | 143.8 | 141.8 | 144.5 | 147.6 | 156.5 | 162.0 | 168.0 | 173.5 | 181.5 | 186.2 |
| **95th: Worst Case** | 152.2 | 151.3 | 161.4 | 174.9 | 192.1 | 215.2 | 233.4 | 252.2 | 269.2 | 280.2 | 295.7 |

Note: Millions ($), Fiscal Years Used

# 2017 Total Contributions Comparison



# Present Value of Total Contributions

## Employer + Member

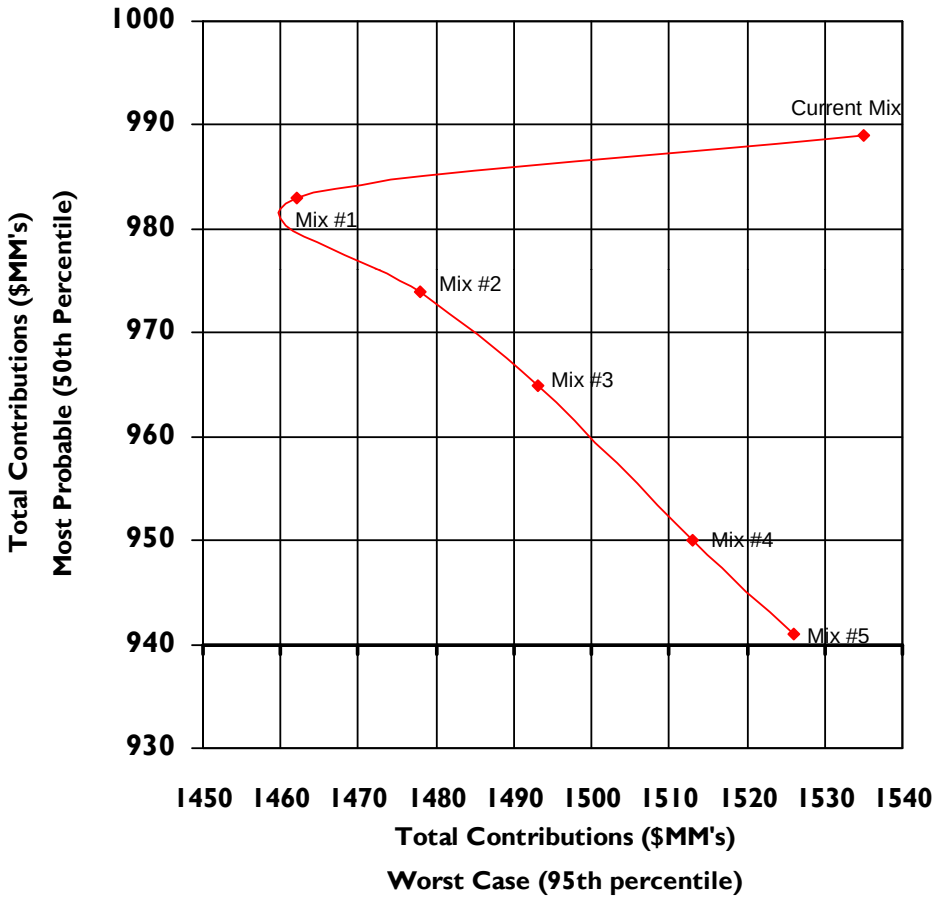
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 456.7 | 508.4 | 537.7 | 547.0 | 553.7 | 559.4 | 567.3 | 571.5 | 577.0 | 583.8 |
| **25th: Optimistic** | 377.7 | 467.7 | 539.0 | 594.8 | 637.5 | 670.4 | 695.2 | 716.1 | 735.5 | 752.9 | 768.0 |
| **50th: Most Probable** | 377.7 | 475.1 | 557.7 | 632.4 | 698.0 | 754.8 | 809.9 | 861.6 | 906.5 | 946.6 | 988.6 |
| **75th: Pessimistic** | 377.7 | 482.6 | 576.1 | 664.4 | 752.0 | 838.3 | 922.6 | 1006.1 | 1080.9 | 1158.6 | 1232.2 |
| **95th: Worst Case** | 377.7 | 492.8 | 605.1 | 717.2 | 831.5 | 949.3 | 1073.5 | 1190.9 | 1303.1 | 1417.6 | 1534.9 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 458.6 | 514.8 | 550.3 | 566.7 | 572.2 | 577.2 | 585.2 | 590.9 | 599.8 | 606.5 |
| **25th: Optimistic** | 377.7 | 468.3 | 540.8 | 598.6 | 642.8 | 678.7 | 709.1 | 733.3 | 753.7 | 769.4 | 784.7 |
| **50th: Most Probable** | 377.7 | 475.3 | 558.0 | 631.5 | 697.0 | 753.7 | 809.0 | 855.5 | 896.9 | 942.4 | 983.0 |
| **75th: Pessimistic** | 377.7 | 482.0 | 573.7 | 660.3 | 744.2 | 826.7 | 906.4 | 980.5 | 1058.8 | 1126.4 | 1197.4 |
| **95th: Worst Case** | 377.7 | 491.8 | 598.7 | 705.0 | 812.0 | 926.3 | 1034.0 | 1147.3 | 1259.3 | 1362.6 | 1462.4 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 457.9 | 511.9 | 544.7 | 557.9 | 563.1 | 567.4 | 572.2 | 577.9 | 584.7 | 593.3 |
| **25th: Optimistic** | 377.7 | 468.1 | 539.8 | 595.7 | 639.3 | 671.2 | 700.1 | 722.2 | 739.6 | 755.0 | 768.6 |
| **50th: Most Probable** | 377.7 | 475.2 | 557.7 | 630.7 | 695.1 | 751.2 | 804.1 | 848.3 | 891.1 | 933.8 | 974.1 |
| **75th: Pessimistic** | 377.7 | 482.1 | 574.3 | 661.0 | 745.6 | 828.4 | 907.5 | 982.2 | 1057.5 | 1125.9 | 1196.5 |
| **95th: Worst Case** | 377.7 | 492.0 | 599.8 | 707.8 | 815.8 | 934.1 | 1044.7 | 1157.7 | 1272.0 | 1379.4 | 1478.6 |

# Present Value of Total Contributions

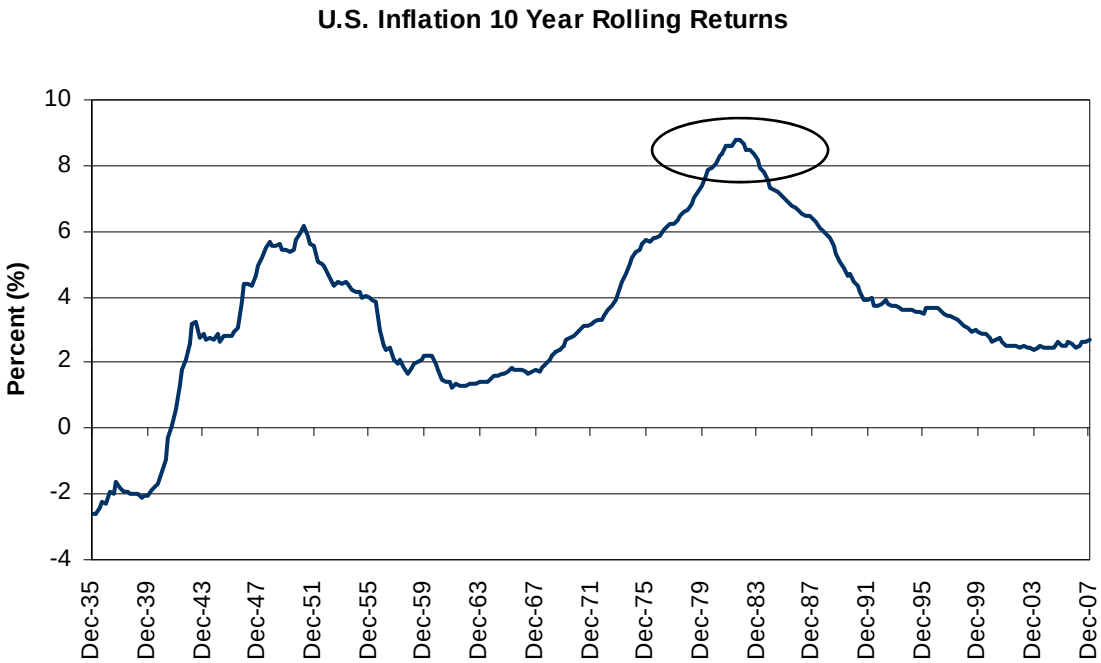
## Employer + Member

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 457.5 | 509.9 | 539.5 | 551.3 | 556.4 | 559.3 | 564.0 | 570.1 | 577.2 | 584.4 |
| **25th: Optimistic** | 377.7 | 468.0 | 539.0 | 594.3 | 635.2 | 665.8 | 692.6 | 712.5 | 728.5 | 744.4 | 756.8 |
| **50th: Most Probable** | 377.7 | 475.0 | 557.2 | 630.6 | 694.2 | 748.3 | 800.8 | 845.9 | 887.0 | 927.7 | 965.8 |
| **75th: Pessimistic** | 377.7 | 482.1 | 574.5 | 661.6 | 746.3 | 828.1 | 907.5 | 984.5 | 1059.5 | 1125.8 | 1196.3 |
| **95th: Worst Case** | 377.7 | 492.2 | 600.5 | 710.4 | 818.3 | 939.4 | 1052.2 | 1166.3 | 1280.0 | 1391.2 | 1493.6 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 456.7 | 507.3 | 533.4 | 542.4 | 547.4 | 549.6 | 555.3 | 559.1 | 565.9 | 572.5 |
| **25th: Optimistic** | 377.7 | 467.5 | 537.7 | 591.1 | 631.5 | 659.3 | 682.5 | 699.4 | 715.1 | 730.3 | 741.2 |
| **50th: Most Probable** | 377.7 | 475.0 | 557.1 | 630.3 | 692.0 | 745.0 | 796.2 | 839.9 | 876.9 | 916.7 | 950.3 |
| **75th: Pessimistic** | 377.7 | 482.1 | 574.9 | 661.9 | 747.1 | 829.5 | 909.2 | 986.7 | 1060.8 | 1127.0 | 1195.1 |
| **95th: Worst Case** | 377.7 | 492.4 | 601.8 | 713.7 | 825.1 | 944.6 | 1063.0 | 1178.0 | 1290.2 | 1405.0 | 1513.5 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 377.7 | 455.9 | 504.8 | 529.5 | 537.6 | 541.1 | 542.4 | 546.5 | 551.3 | 558.8 | 564.6 |
| **25th: Optimistic** | 377.7 | 467.3 | 537.0 | 589.0 | 627.3 | 654.2 | 674.6 | 691.6 | 706.2 | 721.1 | 732.6 |
| **50th: Most Probable** | 377.7 | 474.9 | 556.8 | 629.4 | 691.1 | 742.6 | 793.9 | 835.3 | 870.6 | 906.1 | 941.0 |
| **75th: Pessimistic** | 377.7 | 482.1 | 575.1 | 662.1 | 747.6 | 829.7 | 909.5 | 988.2 | 1062.8 | 1127.5 | 1193.4 |
| **95th: Worst Case** | 377.7 | 492.5 | 602.7 | 715.4 | 829.6 | 949.2 | 1070.4 | 1185.6 | 1301.8 | 1415.8 | 1526.2 |

# 10 Year Present Value of Total Contributions Comparison



# High Inflation Scenario




- To further evaluate all the mixes, we wanted to see how all mixes would fair in a high inflation scenario.
- The worst 10 year period of inflation was from 3Q 1972 – 3Q 1982 where inflation was 8.80%. This scenario was modeled over 10 years to see how contributions and funded status would be effected with each mix.

# Projected Funded Ratios – High Inflation

## Actuarial Assets/Actuarial Liabilities (%)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.5 | 102.6 | 111.3 | 119.0 | 124.6 | 129.9 | 133.4 | 135.5 | 135.3 | 133.0 |
| **25th: Optimistic** | 82.9 | 90.9 | 96.8 | 101.2 | 105.2 | 107.1 | 108.4 | 108.4 | 108.1 | 106.2 | 103.9 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.2 | 95.5 | 96.9 | 96.6 | 95.9 | 94.9 | 92.9 | 91.1 | 88.2 |
| **75th: Pessimistic** | 82.9 | 88.0 | 89.7 | 89.7 | 88.9 | 86.8 | 85.0 | 83.2 | 81.4 | 78.9 | 76.0 |
| **95th: Worst Case** | 82.9 | 86.2 | 85.1 | 82.3 | 79.6 | 75.1 | 72.4 | 70.3 | 68.1 | 66.0 | 63.0 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 92.8 | 101.3 | 108.9 | 115.3 | 120.5 | 124.5 | 128.5 | 130.4 | 131.7 | 131.7 |
| **25th: Optimistic** | 82.9 | 90.8 | 96.3 | 100.5 | 104.5 | 106.5 | 107.6 | 108.0 | 107.7 | 106.4 | 104.2 |
| **50th: Most Probable** | 82.9 | 89.4 | 93.1 | 95.5 | 97.0 | 96.7 | 96.3 | 96.0 | 94.8 | 92.7 | 90.1 |
| **75th: Pessimistic** | 82.9 | 88.2 | 90.3 | 90.7 | 90.2 | 88.4 | 86.9 | 85.4 | 83.3 | 81.2 | 78.3 |
| **95th: Worst Case** | 82.9 | 86.6 | 86.3 | 84.3 | 81.7 | 77.5 | 75.5 | 72.9 | 70.7 | 68.7 | 65.4 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.1 | 101.9 | 110.2 | 117.0 | 122.5 | 127.5 | 131.3 | 134.2 | 135.6 | 136.1 |
| **25th: Optimistic** | 82.9 | 90.9 | 96.7 | 101.1 | 105.1 | 107.5 | 108.7 | 109.4 | 109.3 | 108.2 | 105.9 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.2 | 95.7 | 97.4 | 97.2 | 97.0 | 96.7 | 95.4 | 93.3 | 90.9 |
| **75th: Pessimistic** | 82.9 | 88.2 | 90.2 | 90.5 | 90.1 | 88.2 | 86.7 | 85.2 | 83.3 | 81.2 | 78.4 |
| **95th: Worst Case** | 82.9 | 86.5 | 86.0 | 83.7 | 81.2 | 76.9 | 74.5 | 72.4 | 70.0 | 68.4 | 65.1 |

The High Inflation scenario threatens the fully funded status for all mixes.

The increased real asset allocation in Mixes #1-#5 meaningfully improves the projected funded status in 2017.

Note: Fiscal Years Used

# Projected Funded Ratios – High Inflation

## Actuarial Assets/Actuarial Liabilities (%)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.3 | 102.5 | 110.9 | 118.5 | 124.2 | 129.9 | 134.4 | 137.1 | 139.0 | 139.9 |
| **25th: Optimistic** | 82.9 | 90.9 | 96.9 | 101.4 | 105.6 | 108.0 | 109.5 | 110.3 | 110.3 | 109.4 | 107.3 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.2 | 95.8 | 97.6 | 97.6 | 97.4 | 97.1 | 95.9 | 93.9 | 91.3 |
| **75th: Pessimistic** | 82.9 | 88.1 | 90.1 | 90.3 | 89.8 | 88.1 | 86.6 | 85.1 | 83.3 | 81.3 | 78.6 |
| **95th: Worst Case** | 82.9 | 86.4 | 85.8 | 83.2 | 80.8 | 76.2 | 73.7 | 71.9 | 69.6 | 68.2 | 64.8 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.6 | 103.3 | 112.3 | 120.5 | 126.9 | 133.7 | 138.5 | 142.1 | 143.6 | 144.7 |
| **25th: Optimistic** | 82.9 | 91.1 | 97.2 | 102.0 | 106.5 | 109.2 | 111.1 | 111.9 | 112.2 | 111.4 | 109.4 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.3 | 96.1 | 97.9 | 98.1 | 98.1 | 98.0 | 96.8 | 94.9 | 92.1 |
| **75th: Pessimistic** | 82.9 | 88.1 | 90.0 | 90.2 | 89.7 | 88.0 | 86.4 | 84.9 | 83.4 | 81.5 | 78.9 |
| **95th: Worst Case** | 82.9 | 86.2 | 85.5 | 82.5 | 80.1 | 75.4 | 73.0 | 71.4 | 69.4 | 67.8 | 64.5 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 82.9 | 93.8 | 104.1 | 113.2 | 121.7 | 128.9 | 136.4 | 141.7 | 145.4 | 147.3 | 148.3 |
| **25th: Optimistic** | 82.9 | 91.1 | 97.4 | 102.5 | 107.1 | 110.0 | 112.4 | 113.2 | 113.5 | 113.0 | 110.7 |
| **50th: Most Probable** | 82.9 | 89.5 | 93.4 | 96.2 | 98.1 | 98.5 | 98.4 | 98.6 | 97.3 | 95.8 | 92.7 |
| **75th: Pessimistic** | 82.9 | 88.0 | 89.9 | 90.0 | 89.6 | 87.9 | 86.4 | 84.9 | 83.4 | 81.5 | 79.1 |
| **95th: Worst Case** | 82.9 | 86.1 | 85.2 | 82.1 | 79.7 | 74.9 | 72.4 | 70.7 | 68.8 | 67.3 | 64.3 |

Note: Fiscal Years Used

# Total Contributions – High Inflation

## Employer + Member

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Mix** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 125.1 | 99.0 | 69.9 | 42.5 | 35.0 | 34.4 | 34.6 | 36.0 | 37.1 | 38.9 |
| **25th: Optimistic** | 152.2 | 133.5 | 119.0 | 107.6 | 96.7 | 91.8 | 90.5 | 95.9 | 107.7 | 125.5 | 160.1 |
| **50th: Most Probable** | 152.2 | 138.5 | 132.0 | 129.1 | 128.9 | 136.9 | 150.4 | 166.2 | 191.8 | 223.9 | 273.4 |
| **75th: Pessimistic** | 152.2 | 143.5 | 143.4 | 149.4 | 160.4 | 178.6 | 199.5 | 226.5 | 261.3 | 306.2 | 370.1 |
| **95th: Worst Case** | 152.2 | 150.6 | 160.9 | 177.7 | 198.0 | 228.6 | 261.5 | 293.3 | 338.8 | 399.2 | 495.7 |
| **Mix #1** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 127.5 | 104.6 | 79.0 | 56.3 | 38.3 | 36.5 | 37.0 | 38.3 | 39.5 | 40.9 |
| **25th: Optimistic** | 152.2 | 134.4 | 120.7 | 110.2 | 99.6 | 94.7 | 95.8 | 100.0 | 105.8 | 122.4 | 148.6 |
| **50th: Most Probable** | 152.2 | 138.9 | 131.9 | 128.9 | 128.2 | 136.0 | 147.7 | 161.1 | 182.1 | 213.0 | 254.6 |
| **75th: Pessimistic** | 152.2 | 142.9 | 141.8 | 146.7 | 155.6 | 172.9 | 191.0 | 215.8 | 248.1 | 289.4 | 348.6 |
| **95th: Worst Case** | 152.2 | 149.0 | 156.3 | 168.8 | 188.2 | 218.5 | 246.4 | 279.8 | 325.5 | 385.1 | 474.0 |
| **Mix #2** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 126.6 | 102.4 | 75.6 | 49.7 | 36.2 | 35.4 | 35.8 | 36.9 | 37.8 | 39.9 |
| **25th: Optimistic** | 152.2 | 134.1 | 119.9 | 108.6 | 96.7 | 91.2 | 89.6 | 92.2 | 97.3 | 112.8 | 138.0 |
| **50th: Most Probable** | 152.2 | 138.8 | 131.7 | 128.2 | 127.4 | 133.8 | 144.6 | 157.9 | 178.2 | 207.3 | 248.6 |
| **75th: Pessimistic** | 152.2 | 143.1 | 142.3 | 147.4 | 156.3 | 174.0 | 191.6 | 216.0 | 247.9 | 288.7 | 347.6 |
| **95th: Worst Case** | 152.2 | 149.5 | 157.5 | 171.0 | 190.6 | 221.4 | 249.5 | 283.2 | 327.4 | 383.6 | 471.2 |

The Increased allocation to real assets also meaningfully lowers the projected total contributions are expected to XX in 2017.

Note: Millions ($), Fiscal Years Used

# Total Contributions – High Inflation

## Employer + Member

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mix #3** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 125.8 | 100.2 | 72.3 | 44.3 | 35.3 | 34.9 | 35.3 | 36.2 | 37.3 | 38.7 |
| **25th: Optimistic** | 152.2 | 133.8 | 119.2 | 107.0 | 94.7 | 88.1 | 85.3 | 86.4 | 91.7 | 104.7 | 129.4 |
| **50th: Most Probable** | 152.2 | 138.7 | 131.5 | 127.7 | 126.6 | 132.5 | 142.8 | 154.7 | 175.2 | 203.6 | 245.2 |
| **75th: Pessimistic** | 152.2 | 143.2 | 142.6 | 147.9 | 156.7 | 174.8 | 192.6 | 216.1 | 247.6 | 287.8 | 346.2 |
| **95th: Worst Case** | 152.2 | 149.8 | 158.3 | 173.2 | 192.6 | 225.4 | 253.2 | 286.0 | 329.2 | 382.5 | 473.0 |
| **Mix #4** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 124.8 | 97.4 | 67.9 | 37.0 | 34.4 | 34.3 | 34.5 | 35.2 | 36.8 | 37.8 |
| **25th: Optimistic** | 152.2 | 133.4 | 118.2 | 105.1 | 91.4 | 83.2 | 78.5 | 78.7 | 81.9 | 94.1 | 116.5 |
| **50th: Most Probable** | 152.2 | 138.6 | 131.3 | 127.0 | 125.2 | 130.2 | 140.1 | 151.0 | 169.8 | 198.0 | 238.3 |
| **75th: Pessimistic** | 152.2 | 143.4 | 142.9 | 148.2 | 157.2 | 175.4 | 193.6 | 217.2 | 247.2 | 287.4 | 343.2 |
| **95th: Worst Case** | 152.2 | 150.3 | 159.8 | 175.7 | 195.9 | 228.4 | 257.5 | 290.6 | 332.6 | 385.8 | 474.9 |
| **Mix #5** | | | | | | | | | | | |
| **5th: Best Case** | 152.2 | 123.8 | 94.5 | 64.4 | 35.5 | 34.0 | 34.1 | 34.2 | 34.9 | 35.8 | 37.4 |
| **25th: Optimistic** | 152.2 | 133.1 | 117.4 | 103.4 | 88.9 | 79.4 | 73.2 | 72.6 | 76.2 | 86.8 | 108.4 |
| **50th: Most Probable** | 152.2 | 138.6 | 131.1 | 126.4 | 123.9 | 128.6 | 138.5 | 148.8 | 166.4 | 193.3 | 233.7 |
| **75th: Pessimistic** | 152.2 | 143.5 | 143.3 | 148.5 | 157.5 | 176.0 | 194.9 | 217.1 | 247.0 | 287.3 | 342.2 |
| **95th: Worst Case** | 152.2 | 150.7 | 160.8 | 177.0 | 198.2 | 229.6 | 260.2 | 291.9 | 334.5 | 387.5 | 473.8 |

Note: Millions ($), Fiscal Years Used

# *VII. Recommendation & Implementation*

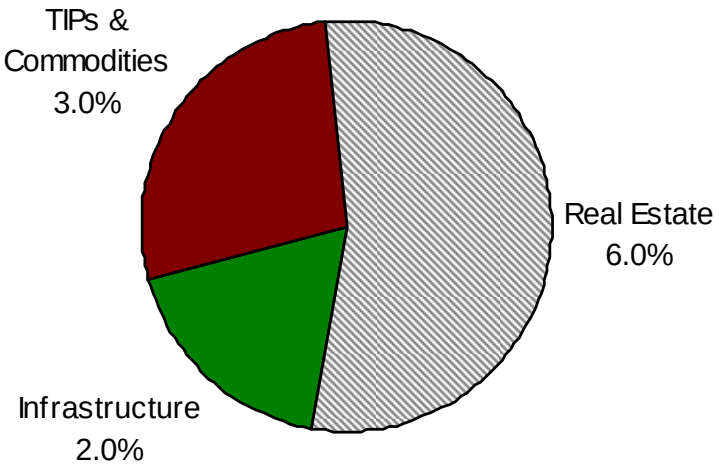
# Recommendation: Portfolio Mix #4

- Given recent market declines, Mix #4 is more attractive than Mix #3.
- Increase rate of return by 34 basis points from current mix while slightly increasing the expected standard deviation by 24 basis points.
- Meaningfully more efficient than current mix with a sharpe ratio of 0.397 versus 0.375 for the current mix.
- Expected Present Value of Total Contributions in 2017 is $38.3 million lower than Current Mix while the worst case is also lower than the Current Mix by $21.4 million.
- Meaningfully improves projected 2017 funded ratio with a superior worst case ratio.

# Implementation Overview

- Employ two Small Cap International managers with a 3.0% allocation to each manager.
- Establish a Real Asset allocation to hedge against higher inflation.
- Reduce US Core Plus Fixed Income manager structure by one manager.
- Employ Opportunistic Fixed Income Strategy with two managers (3.0% allocation to each).
- Establish a 9.0% Hedge Fund allocation by expanding Blackstone from $15 million to $80 million and employ two additional Hedge Fund managers with approximately $80 million each.
- Continue Private Equity vintage year and strategy diversification by expanding allocation by 1.0% to 7.0% of Total Plan.

# Real Assets - Implementation




**Target 11.0% of Total Plan**

**Approximately $300,990,000**

**Real Estate:**

- Diversify between core, value added, and opportunistic strategies.
- The recommended mix is 60% Core, 20% Value Added, 20% Opportunistic, respectively.

**Infrastructure:**

- Low correlations to traditional asset classes, good inflation hedge given structure of underlying contracts.
- Diversify into 2 different Infrastructure strategies

**TIPs & Commodities:**

- Opportunistically allocate to Commodities once valuations become more compelling.

# Real Estate: Core, Value Added, & Opportunistic

While Core Real Estate focuses on high quality tenants and properties, Value-Added and Opportunistic strategies take more risk with under-leased properties or development opportunities, and use more leverage.

| Core | Value-Added | Opportunistic |
|---|---|---|
| • High quality, multi-tenant properties<br>• Major metro areas<br>• High quality tenants<br>• Properties held as long-term asset, yield<br>• Funds are typically open-ended, offering reasonable liquidity | • Properties need greater management involvement<br>• Properties have greater leasing risk (high tenant turnover)<br>• Poorly positioned properties, typically need capital investments<br>• New developments<br>• Properties held for shorter period than core<br>• Funds are typically closed-ended, locking capital for 7-10+ years | • Non-performing assets & distressed loans<br>• Development or significant redevelopment<br>• Operating companies<br>• Overseas markets<br>• Liquidity constrained markets<br>• Properties held for shorter period than core<br>• Funds are typically closed-ended, locking capital for 7-10+ years |
| • **Leverage is typically between 0% to 30%** | • **Leverage can be upwards of 60%** | • **Leverage is typically above 65%** |

# Infrastructure

- Infrastructure refers to any permanent asset that a society requires to facilitate the orderly operation of its economy. This may include transportation, utilities and social services, among other things. Due to the large size and cost and often monopolistic nature of these assets, infrastructure has historically been financed, built, owned and operated by the government.
- Institutional investment in infrastructure is facilitated though what is often referred to as a "public-private partnership." These partnerships are contractual agreements formed between a public agency and a private entity.
- Infrastructure is an emerging investible asset class that institutional investors are considering primarily due to the diversification benefits of this asset class. Additional benefits include:
  - Stable returns and low volatility
  - Steady cash flows
  - Inflation hedge
  - Long duration


**Inderkum High School, Sacramento, CA**

*Source: UBS Investment Research, The News Tribune (Tacoma Narrows Bridge Project photo); Natomas School District (Inderkum photo)*

# Commodities

- Inflation protection
  - Commodity prices tend to rise with inflation
  - Commodities tend to perform well in rising inflation environments
- Diversification
  - The correlation with other asset classes is very close to zero.
  - Business and commodity cycles have different timings and magnitudes
  - Commodity prices are affected by factors other than capital market and economic conditions, such as:
    - Delivery and warehousing constraints
    - Change in supply or demand
    - Weather
    - Trade
    - Fiscal, monetary and/or exchange control policies
    - Disease & pestilence
    - Technological developments
    - Changes in interest rates

# Commodities

Commodities consist of raw materials which serve as inputs for many essential products. Examples include energy (e.g. oil, natural gas), agriculture & animal products (e.g. corn, wheat, cattle, hogs), and precious metals (gold, silver, copper). Commodities are included in institutional portfolios primarily due to the inflation hedging aspect of the asset class. Additional benefits include:

1. Good diversification due to low-to-negative historical correlation to equity and bond markets
2. Strong historical performance (and comparable volatility) relative to traditional asset classes

| Period: 1993 - 2007 | | | | | | |
|---|---|---|---|---|---|---|
| | **DJ AIG Commodity** | **S&P 500** | **MSCI EAFE** | **Russell 2000** | **Lehman Aggregate** | **Inflation (CPI)** |
| **Annualized Return** | 9.18% | 10.48% | 9.92% | 10.10% | 6.47% | 2.68% |
| **Annualized Standard Deviation** | 12.30% | 14.80% | 15.87% | 18.78% | 3.92% | 1.31% |
| **Correlation w/ DJ AIG Commodity** | 1.00 | -0.18 | 0.01 | -0.11 | -0.16 | 0.33 |

*Return, standard deviation and correlation based on quarterly data. Source: Ibbotson.*

# Opportunistic Fixed Income

- Opportunistic Bond managers will
  - Focus on a firm's "best ideas"
  - Make larger allocations to "plus" sectors
  - Allow for sector allocations to vary widely over time
  - Generally ignore benchmark sector allocations
  - Allow for lower overall portfolio quality
  - Take more aggressive yield curve and duration positions

# Opportunistic Fixed Income Sectors

- Performance of individual fixed income sectors has varied widely
- Opportunity set for opportunistic sector rotation is very large

## Relative Annual Return Comparison for Selected Fixed Income Sectors

| | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| Highest Return | 11.6 | 11.9 | 11.9 | 11.4 | 29.3 | 16.5 | 8.5 | 16.2 | 26.0 | 11.8 |
| | 7.0 | 10.5 | 5.7 | 11.1 | 29.0 | 14.8 | 8.4 | 15.7 | 4.7 | 9.8 |
| | 6.9 | 7.3 | 5.3 | 8.6 | 11.0 | 14.3 | 8.4 | 13.2 | 3.4 | 8.7 |
| | 6.9 | 5.2 | 4.3 | 8.5 | 8.4 | 10.2 | 8.2 | 11.6 | 2.4 | 8.5 |
| | 6.6 | 5.1 | 2.9 | 5.6 | 6.9 | 9.1 | 7.9 | 11.2 | 2.4 | 7.0 |
| | 6.5 | 4.3 | 2.8 | 5.3 | 5.9 | 8.7 | 7.3 | 11.2 | 1.9 | 6.9 |
| | 6.1 | 4.3 | 2.7 | 4.9 | 4.1 | 8.5 | 7.2 | 10.3 | 0.8 | 5.3 |
| | 5.3 | 3.6 | 2.6 | 4.7 | 3.1 | 6.4 | 5.3 | 8.1 | -0.1 | 3.9 |
| | 1.9 | 2.7 | 2.4 | 4.3 | 3.1 | 1.1 | 2.6 | 4.9 | -0.8 | 1.9 |
| Lowest Return | 1.9 | 0.5 | 1.9 | 1.5 | 2.1 | -1.4 | -0.8 | -5.9 | -7.7 | -14.4 |

| | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| Return Spread | 9.7 | 11.4 | 10.0 | 9.9 | 27.2 | 17.9 | 9.3 | 22.1 | 33.7 | 26.2 |

LEGEND

| | | | |
|---|---|---|---|
| Bank Loans | CSFB Leveraged Loan Index | Long Duration | Lehman Long Gov't/Credit |
| Core | Lehman Aggregate | Low Duration | ML Domestic Master 1-3 Year |
| Emerging | JP Morgan Emerging Markets Bond | MBS/ABS | Lehman Mortgage |
| Global | Lehman Global Aggregate - Hedged | TIPS | Lehman U.S. TIPS |
| High Yield | Lehman High Yield | Core Plus Median | eA Core Plus Fixed Universe |

*Source: Lehman Brothers, JP Morgan, Merrill Lynch, Credit Suisse, eVestment Alliance*

# Opportunistic Fixed Income Strategies

- Opportunistic Fixed Income strategies vary in many ways, including:
  - Sector allocation
  - Benchmarks
  - Hedging
  - Vehicle/Liquidity (Separate Account/Mutual Fund/Commingled Pool)
  - Leverage/Shorting

**Sector Allocations as of December 31, 2007**

| *12/31/07 Allocations* | *US Govts/ Agencies* | *US Inv. Grade Corps* | *US High Yield* | *US MBS/ ABS* | *Convertibles* | *Dev. Mkt Debt* | *Emrg. Mkt Debt* | *Bank Loans* | *Other* |
|---|---|---|---|---|---|---|---|---|---|
| Brandywine Global Opportunistic FI | 6% | 11% | --- | 2% | --- | 62% | 11% | --- | 8% |
| Loomis, Sayles Multisector Full Discretion | 4% | 32% | 25% | 0% | 4% | 29% | 2% | 3% | 1% |
| Loomis, Sayles Multisector Absolute Return | 2% | 29% | 25% | 0% | 3% | 21% | 2% | 18% | 1% |
| MetWest Strategic Income | --- | 14% | 18% | 68% | --- | --- | --- | --- | --- |
| PIMCO Diversified Income | 1% | 20% | 24% | 18% | --- | --- | 37% | --- | --- |
| Principal Mult-Sector Plus | 7% | 23% | 11% | 48% | --- | 6% | 2% | 3% | --- |
| WAMCO US Absolute Return Strategy | 5% | 8% | 10% | 61% | --- | 2% | 3% | 11% | --- |
| Blackrock Fixed Income Global Opportunities | 0% | 13% | 3% | 75% | --- | 4% | --- | --- | 5% |

Note: Highlighted strategies are existing FCERA managers

*Source: eVestment Alliance*

# Opportunistic Fixed Income Performance

## Trailing Performance as of December 31, 2007

| 12/31/2007 Performance | 1 Year | 2 Years | 3 Years | 5 Years | 7 Years | 10 Years |
|---|---|---|---|---|---|---|
| BlackRock Fixed Income Global Opportunities | 3.5 | 4.3 | 3.5 | --- | --- | --- |
| Brandywine Global Opportunistic FI | 10.7 | 9.7 | 6.1 | 11.7 | 12.0 | 9.9 |
| Loomis, Sayles Multisector Full Discretion | 5.3 | 5.6 | 4.5 | 6.4 | 6.6 | 5.9 |
| Loomis, Sayles Multisector Absolute Return | 6.9 | 8.7 | 7.0 | 11.5 | 9.9 | 8.3 |
| MetWest Strategic Income | -3.1 | 1.2 | 1.9 | --- | --- | --- |
| PIMCO Diversified Income | 4.9 | 6.7 | 6.7 | --- | --- | --- |
| Principal Mult-Sector Plus | 5.2 | 5.2 | --- | --- | --- | --- |
| WAMCO US Absolute Return Strategy | 2.5 | 4.9 | 4.5 | --- | --- | --- |
| Lehman Aggregate Index | 7.0 | 5.6 | 4.6 | 4.4 | 5.8 | 6.0 |

## Trailing Standard Deviation as of December 31, 2007

| 12/31/2007 Standard Deviation | 3 Years | 5 Years | 7 Years | 10 Years |
|---|---|---|---|---|
| BlackRock Fixed Income Global Opportunities | 1.3 | --- | --- | --- |
| Brandywine Global Opportunistic FI | 3.9 | 6.1 | 7.7 | 7.7 |
| Loomis, Sayles Multisector Full Discretion | 3.2 | 4.2 | 4.1 | 3.8 |
| Loomis, Sayles Multisector Absolute Return | 3.1 | 6.3 | 6.1 | 6.0 |
| MetWest Strategic Income | 3.3 | --- | --- | --- |
| PIMCO Diversified Income | 3.8 | --- | --- | --- |
| Principal Mult-Sector Plus | --- | --- | --- | --- |
| WAMCO US Absolute Return Strategy | 2.4 | --- | --- | --- |
| Lehman Aggregate Index | 3.3 | 3.4 | 3.6 | 3.5 |

Note: Highlighted strategies are existing FCERA managers

*Source: eVestment Alliance*

# Hedge Funds

Hedge funds of funds are included in portfolios for a number of reasons, including:

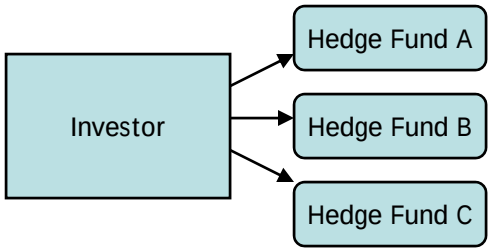
1. Risk Reduction
2. Diversification
3. Return enhancement in light of low expected returns from bonds

| 10-Year Period: 1997 - 2007 | | | | | | |
|---|---|---|---|---|---|---|
| | **HFRI Fund of Funds** | **S&P 500** | **MSCI EAFE** | **Russell 2000** | **Lehman Aggregate** | **Inflation (CPI)** |
| **Annualized Return** | 7.3% | 10.48% | 9.92% | 10.10% | 6.47% | 2.68% |
| **Annualized Standard Deviation** | 7.0% | 14.80% | 15.87% | 18.78% | 3.92% | 1.31% |
| **Correlation w/ HFRI Fund-of-Funds** | 1.00 | 0.49 | 0.63 | 0.55 | 0.09 | -0.01 |

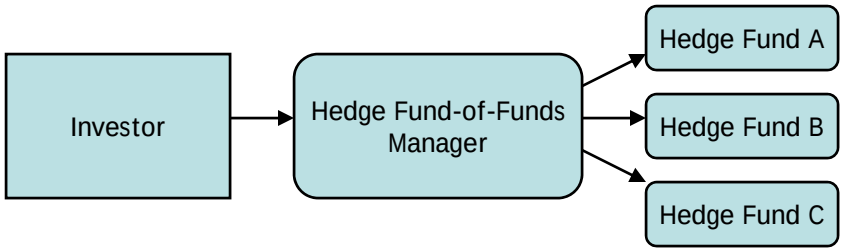
Note: The Hedge Fund Research, Inc. (HFRI) Fund of Funds Index is a composite of funds that invest in multiple hedge fund managers and strategies. The database includes over 500 funds and returns are shown net of fees. Average fees for a hedge fund-of-funds manager are 1.3% in addition to underlying hedge fund managers' management and performance-based fees. Correlations based on quarterly data. Source: Ibbotson.

# Hedge Fund Implementation

***Individual Fund Investing***




***Fund-of-Fund Investing***




In a Fund-of-Funds strategy, An intermediary manager aggregates capital from multiple investors and invests in a broad range of diversified hedge fund or private equity strategies.

**Diversification**

- A Fund-of-Funds will diversify across a number of strategies and managers reducing the volatility of investing in a single manager or strategy.

**Added Due Diligence**

- The Fund-of-Funds manager adds another layer of analytical rigor.

**Access**

- Fund-of-Funds pools assets of smaller commitment investors, allowing investment funds which normally require large asset commitments.

**Fees**

- A major drawback to investing in FoF is the double layer of fees. The FoF manager charges a fee on top of the fees charged by each of the underlying hedge funds.

# *VIII. Appendix*

# Wurts' Long-Term Capital Market Assumptions

Wurts & Associates utilizes a combination of fundamental analysis and a building blocks approach to construct projected returns for key asset classes.

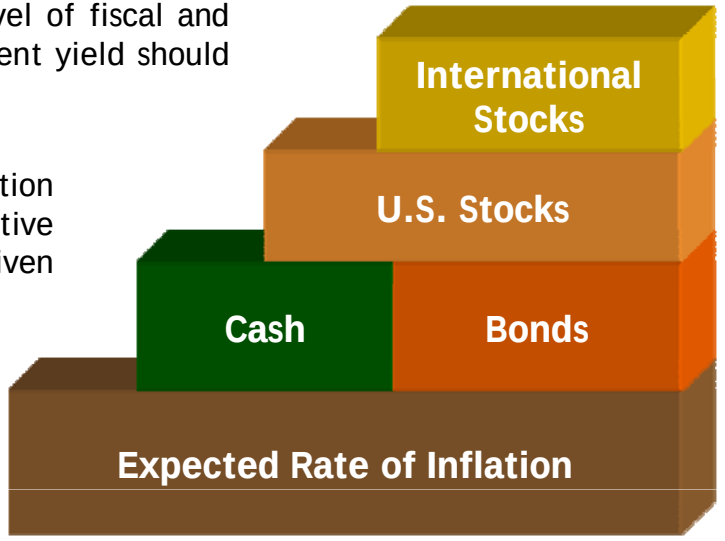
**International Stocks:** The historical relationship between returns for international and U.S. stocks is examined to determine if a premium should exist for international stocks. An overlay of fundamental analysis is applied for minor adjustments.

**U.S. Stocks:** We estimate an Equity Risk Premium based upon the historic range of premia. This is fine-tuned with fundamental returns decomposition.

**Bonds:** We believe that a bond's yield is an unbiased measure of market expectations regarding future returns. Given historically low rates and the high level of fiscal and monetary stimulus, we believe rates will rise over time, and the current yield should be adjusted as a predictor of future returns.

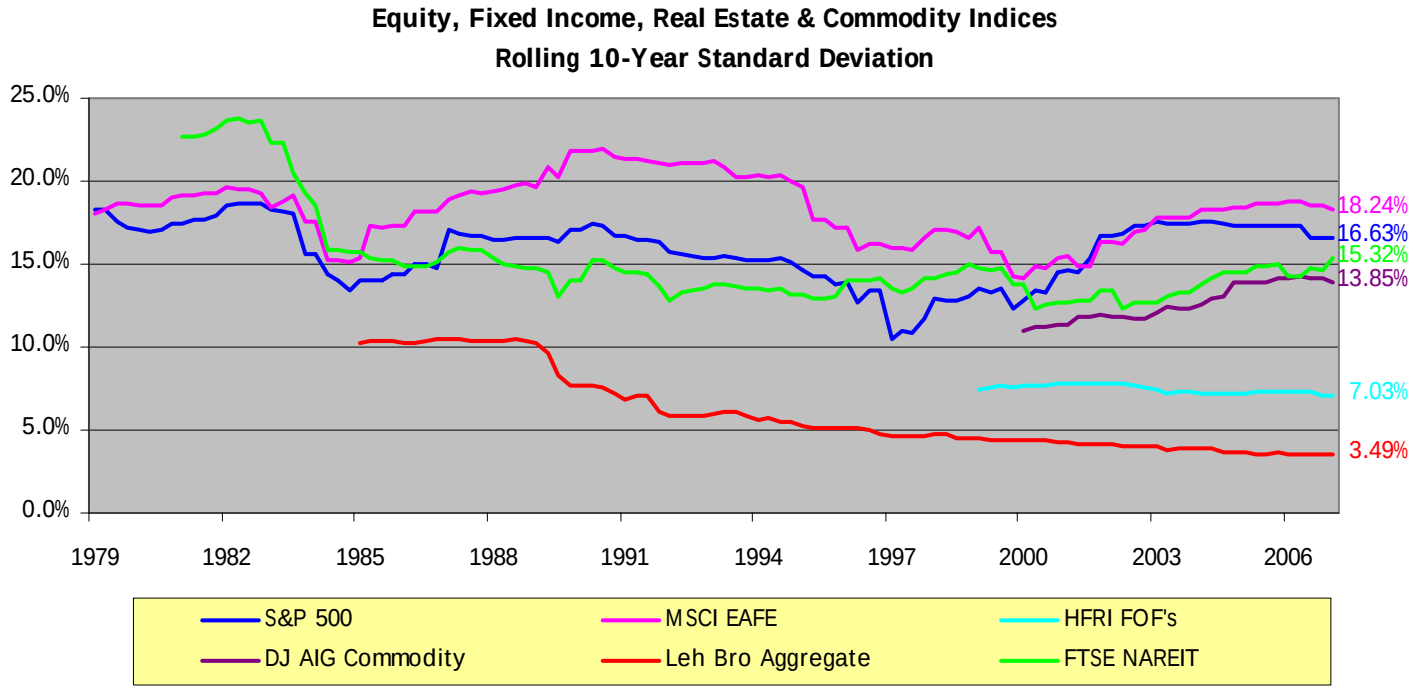
**Cash:** We examine the historic premium of cash instruments to inflation and compare to the current yield and inflation rate. A qualitative judgment is made about the size and sustainability of the premium given today's environment.

**Inflation:** We utilize the break-even inflation rate between the ten-year TIPS and conventional Treasuries as a starting point. Adjustments are made based upon our view of the macroeconomic environment.



# Standard Deviation Assumptions Methodology

- To derive 2008 risk estimates, we first analyze historical standard deviations of the major asset classes since the inception of reliable indices
- After analyzing historical observations, we analyzed standard deviations over rolling 10-year periods to observe any secular trends

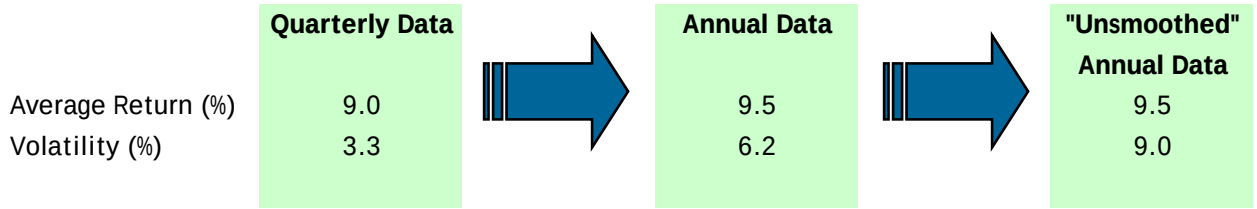



*Source: Ibbotson, PIMCO*

# Standard Deviation Assumptions Methodology

- Private Real Estate – numerous shortcoming associate with NCREIF Property index series
  - Index includes only a limited number of properties relative to the entire real estate market
    - BUS – total capitalization of US property market is more than $3 trillion
    - NCREIF market cap as of 9/30/2007: $292 billion
  - Returns are appraisal-based rather than market-based, which subject real estate returns to a natural smoothing process
  - Schedule of appraisals is heavily weighted to the fourth quarter

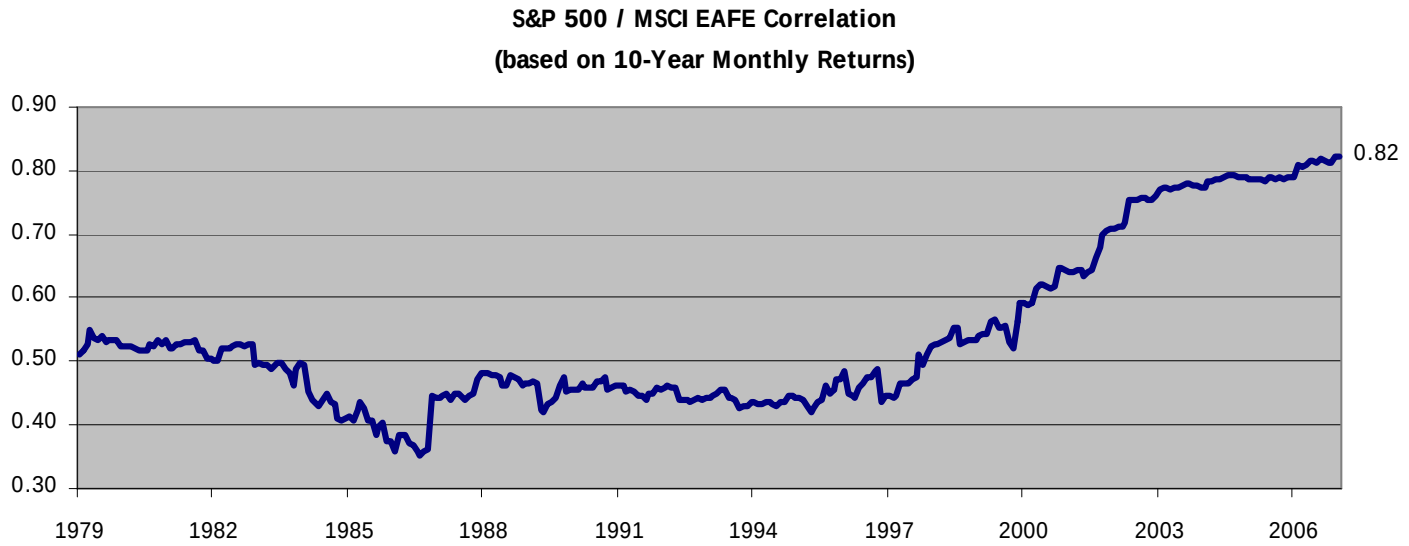
- Given the shortcomings of analyzing private real estate, we researched alternative methodologies which seek to correct for the appraisal cycle
  - Goldman Sachs study found that after adjusting for appraisal-based smoothing, volatility measured approximately 9.0% (compared to 6.2% on an unsmoothed basis)
  - Consequently, we've adjusted our standard deviation for private real estate to 9.0%




*Source: Berger, Adam and Kurt Winkelmann. "Public and Private Real Estate: Yesterday, Today and Tomorrow: Goldman Sachs Asset Management, Strategic Research, May 2005.*

# Correlation Assumptions Methodology

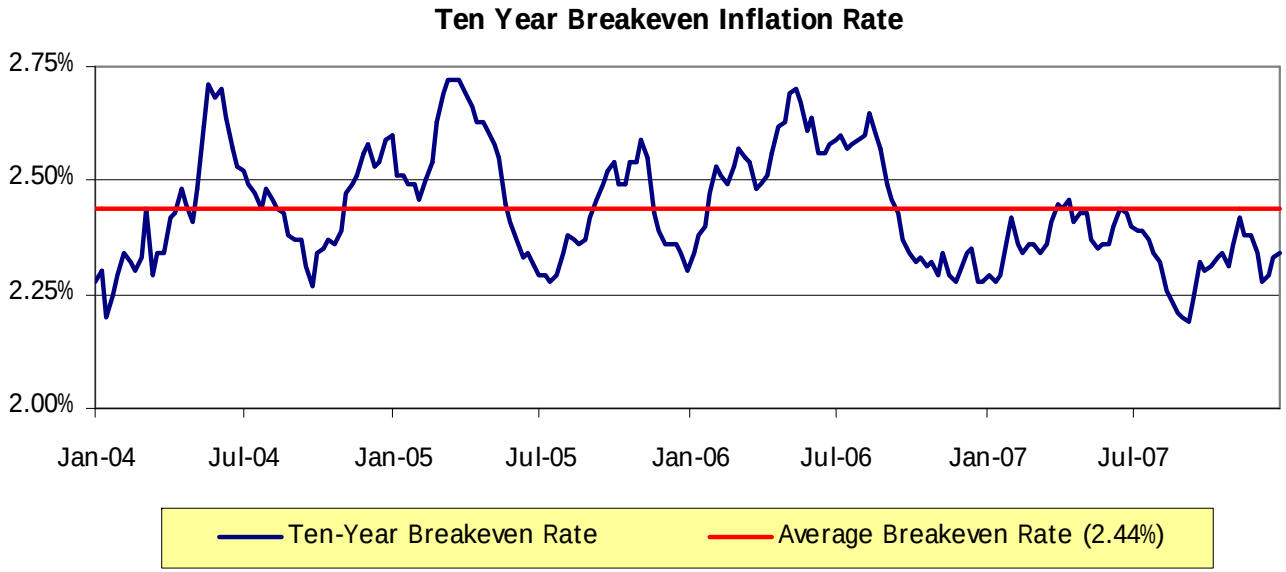
- Similar to our methodology for standard deviations, we estimate correlation between asset classes by first analyzing historical returns since the inception of reliable indices
- After analyzing historical observations, we analyzed rolling correlations over 10-year periods to observe any secular trends
  - Example of Correlation Methodology: Domestic and International Equity
    - Correlation of S&P 500 and MSCI EAFE has historically been approximately 0.69 (from 1970 – 2007)
    - Correlation of the two indices has steadily risen as the world has increasingly globalized. In the ten-year period ending December 2007, correlation rose to 0.82, its highest level ever
    - Based on this analysis, we have raised our correlation to 0.80 to reflect our assumption that the world's globalization will cause continued strong correlation between the S&P 500 and MSCI EAFE




*Source: Ibbotson*

# Inflation Assumption

- Derived from examining market-based inflation forecast as well as historical observations
  - Market-based forecast is based on yield difference between 10-year Treasuries and Treasury Inflation-Protected Securities (TIPS)
  - As of December 31st, 2007, this "breakeven" rate was 2.31% (based on 4.04% yield for 10-year Treasuries and 1.73% yield on 10-year TIPS)

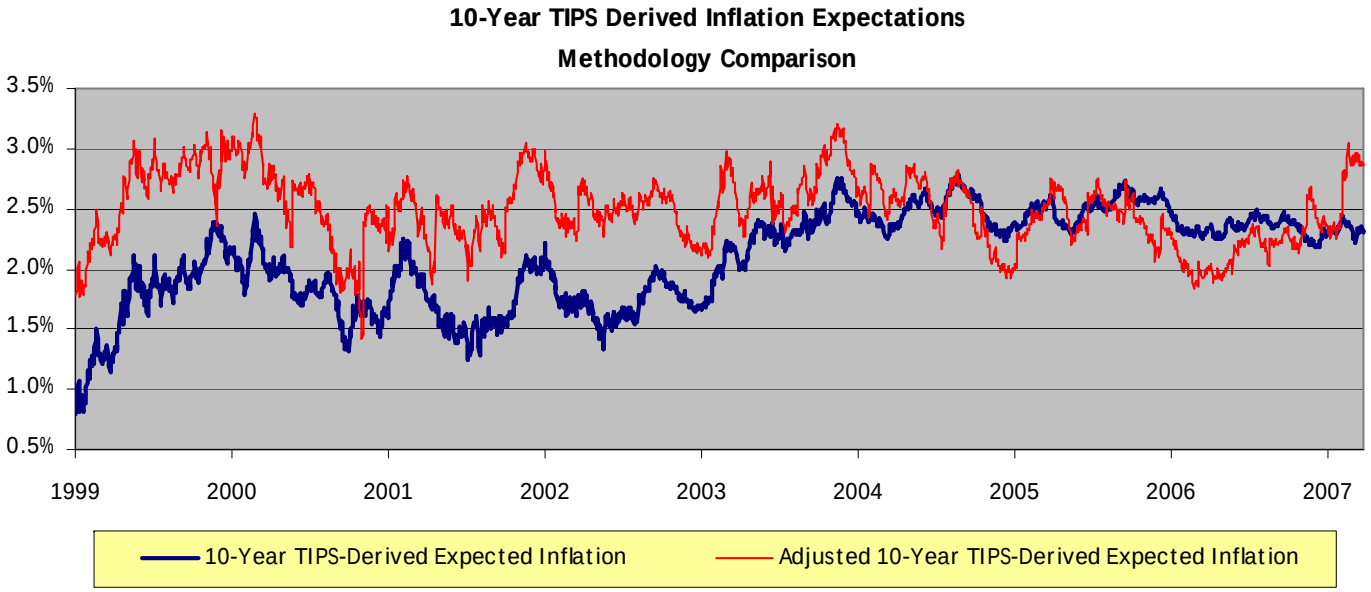



*Average = 2.4%.*

*Source: Federal Reserve Bank of Cleveland*

# Inflation Assumption

- While a generally acceptable methodology, studies suggest breakeven may underestimate actual expected inflation by 50-100 basis points (inflation, illiquidity risks)
  - Federal Bank of Cleveland attempts to correct biases by estimating adjusted inflation
  - As of December 28, 2007 inflation is expected to average 2.9% over the next ten years
    - Closer to historical observations (inflation has averaged 3.0% over the past twenty years)
  - 2.70% inflation assumption settles at mid-point of historical / breakeven rates

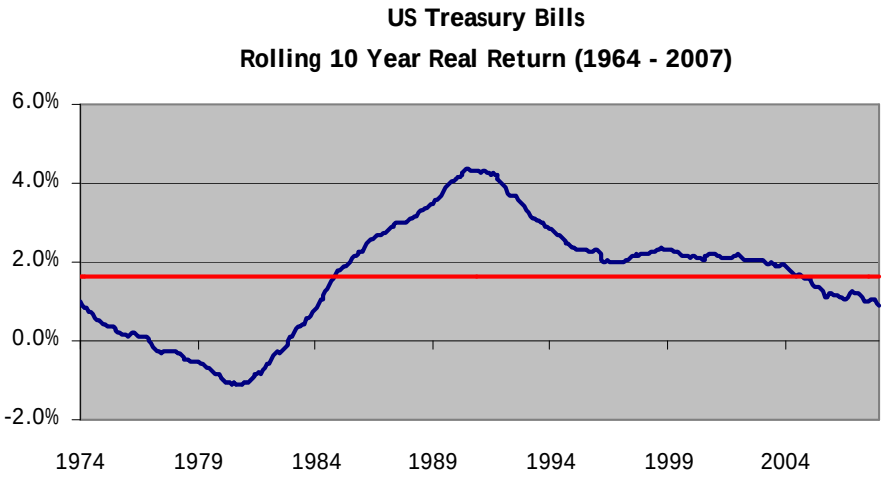


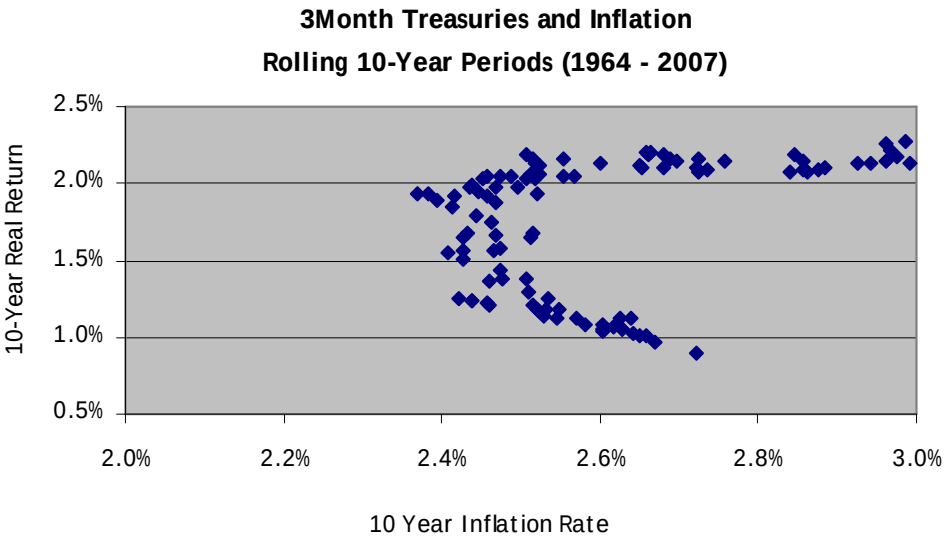

*Average Adjusted TIPS Derived Inflation Expectation = 40 bp premium*

*Source: Federal Reserve Bank of Cleveland. Inflation risk refers to the uncertainty of actual real return on nominal treasuries versus the certainty of a TIPS real return. Liquidity risk refers to the less liquid market for TIPS relative to conventional treasuries ($471 billion compared with $3.0 trillion as of December 31, 2007). "Calculating Inflation Expectations Using Two Kinds of Treasury Securities" < http://www.clevelandfed.org/research/inflation >*

# Cash Equivalents Assumption

- Wurts' ten-year estimate for cash equivalents is 4.0%
  - Observed historical 10-year premium over inflation since 1964 (average real returns of 1.6%)
  - Mid-to-late 1970's experienced abnormally high inflation (i.e. negative real returns for cash)
  - Examine 10-year periods where inflation averaged between 2.0% and 3.0%, real returns averaged 1.7% with low dispersion of observations
  - Given current yields (3.36% on 3M Treasuries as of 12/31/2007), estimate long-term real returns of 1.37%. Add inflation estimate equals 4.0% cash forecast

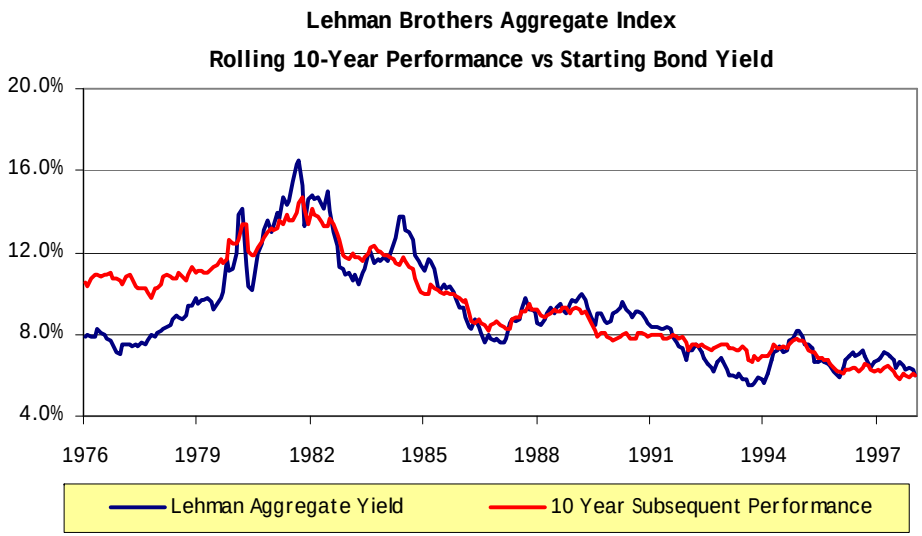


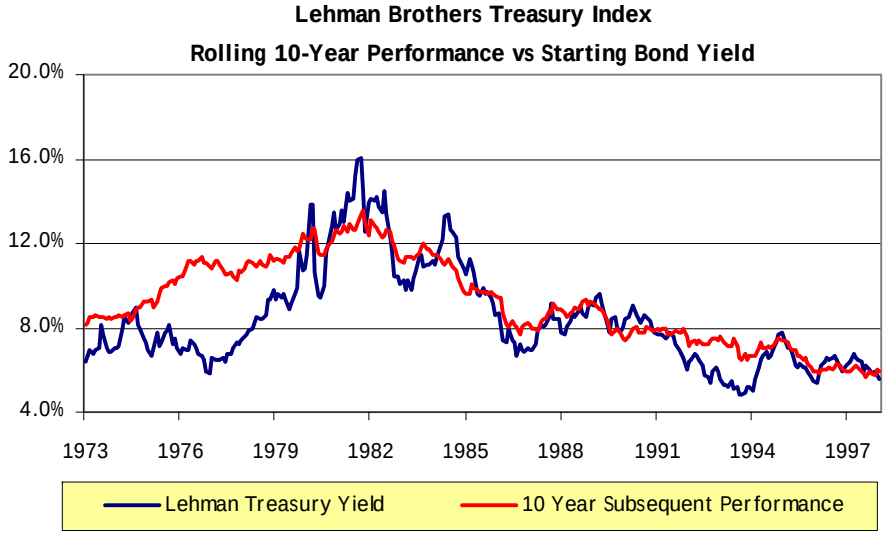




*The indices used to represent treasuries are the International Monetary Fund (IMF) US T-bill TR series (from 1964 – 1987) and the Citigroup 3Month Treasury index (from 1978 – 2007). Source: Ibbotson Associates.*

# Core Plus Fixed Income Assumption

- Historically, starting bond market yields have served as excellent predictors of subsequent ten-year performance (true for treasuries and diversified portfolios such as Lehman Agg)
  - Historical correlation between starting yield and subsequent 10-year performance on Lehman Aggregate has historically been approximately 0.86
  - Historical correlation for Lehman Treasury index has been 0.76. However, from 1982 to 2007, the correlation has been even stronger at 0.92.

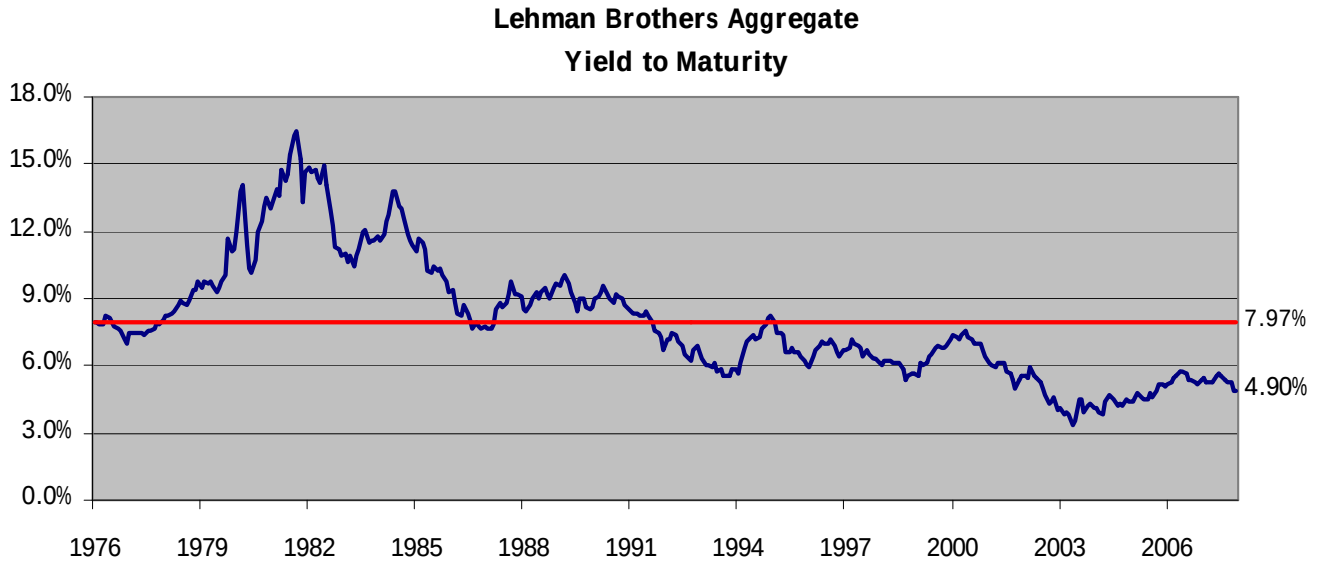



*Source: Ibbotson*

# Core Plus Fixed Income Assumption

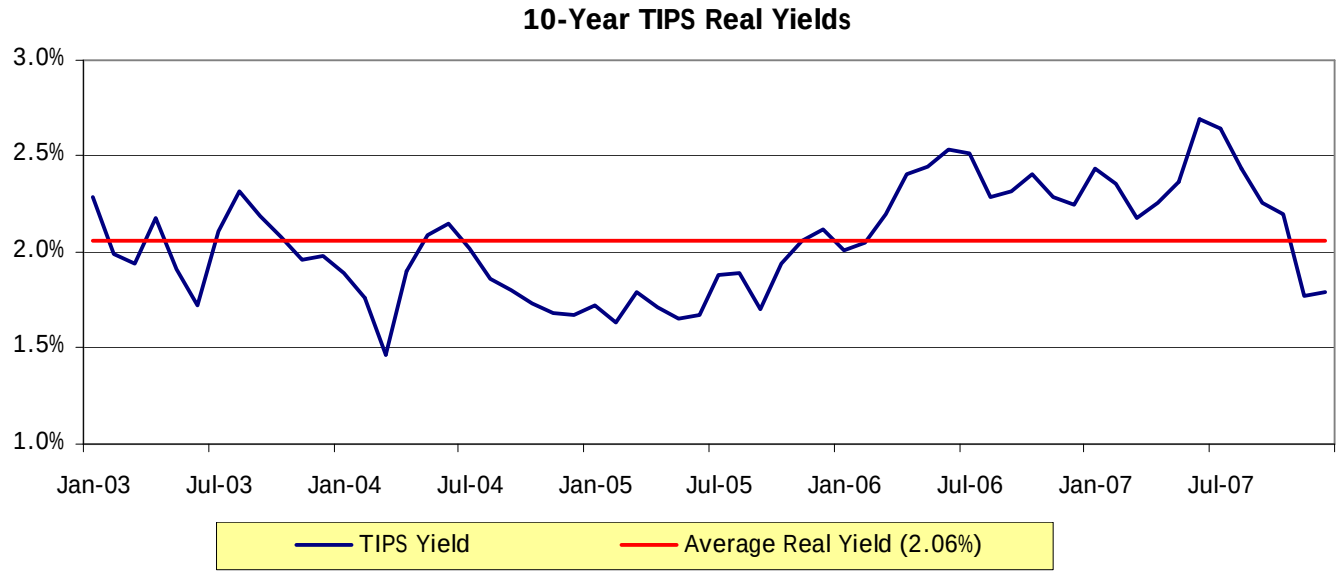
- The year-end 2007 yield-to-maturity on the Lehman Brothers Aggregate Bond index was 4.90%, 46 basis points lower from Dec 2006.
  - Current yield on Lehman Agg near historic lows, partly attributable to lower yields on Treasuries
  - Given current bond yields below equilibrium, we are inclined to believe that rates will rise from current levels. Therefore, the total return on core bonds will have limited upside
  - Based on this assertion and the strong relationship between starting yields and subsequent performance, we project a total return on core fixed income of 5.25%.




*Source: Ibbotson*

# Treasury Inflation-Protected Securities Assumption

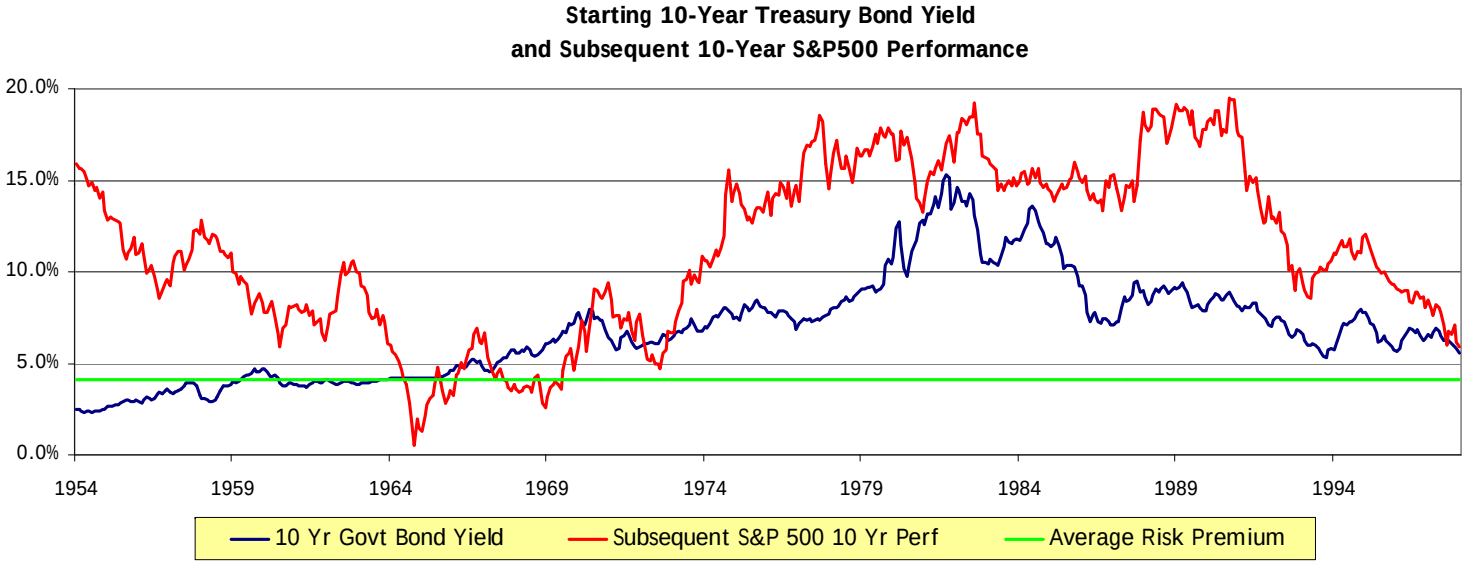
- Wurts' ten-year forecast for TIPS is 4.80%
  - Estimate inflation will average 2.7%
  - Real yield on 10-Year TIPS as of 12/31/2007 was 1.7% (down 70 bps from year-end 2006)
    - In an environment of 2-3% inflation, we expect TIPS to perform in line with Treasuries
  - ➢ Given inflation forecast of 2.7% is higher than market's current inflation estimate, we expect TIPS portfolio to slightly outperform nominal Treasuries over the next ten years
    - Forecast is sum of estimated equilibrium real yields of 2.1% (average TIPS real yield since January 2003) and inflation estimate of 2.70%




*Source: Federal Reserve Bank.*

# Large Cap US Equity Assumption

- Equity risk premium is difficult to predict
  - Distribution of a ten-year equity risk premium around a starting government bond yield varies widely due to valuations, dividend yields, inflationary factors




| Starting 10-Year Treasury Bond Yields | | | | | | |
|---|---|---|---|---|---|---|
| | **Below 3%** | **3% - 4%** | **4% - 5%** | **5% - 6%** | **6% - 7%** | **Over 7%** |
| Average Subsequent 10 Year Return of S&P 500 | 13.0% | 9.4% | 5.6% | 6.6% | 7.9% | 14.9% |

*Starting yield is poor indicator of subsequent 10-year equity performance*

*Source: Ibbotson, Federal Reserve Bank.*

# Large Cap US Equity Assumption

- To derive our large cap equity estimate, we use an earnings-based model, which decomposes equity returns into four components:
  - Inflation
  - Growth in real earnings per share
  - Growth in the price-to-earnings ratio
  - Income return

- Ibbotson earnings model historical decomposition
  - Dividends have comprised the largest segment of returns, followed by inflation
  - Contributions from price-to-earnings expansion / contraction has historically been volatile

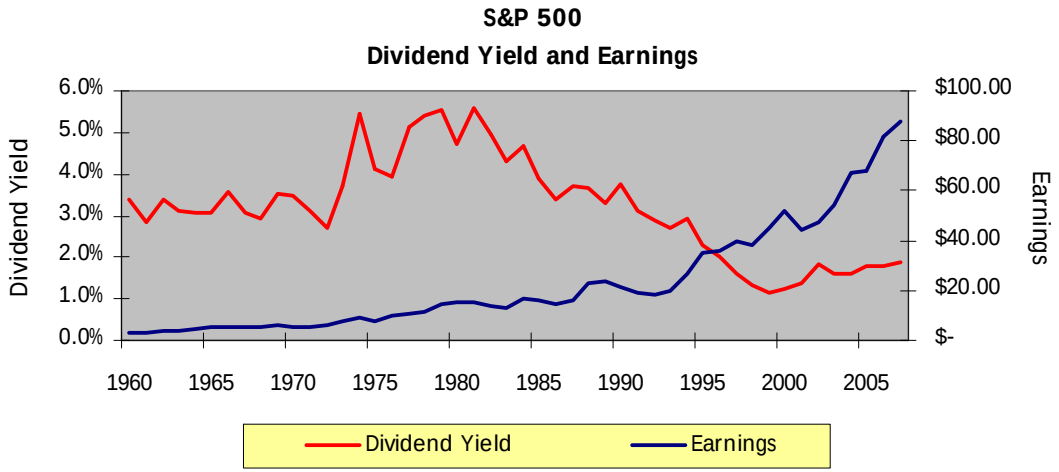
| S&P500 Earnings Model Return Decomposition | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1926 - 2006** | 2000-2006 | 1990's | 1980's | 1970's | 1960's | 1950's | 1940's | 1930's |
| Income Return | **4.2%** | 1.7% | 2.6% | 4.6% | 4.1% | 3.3% | 5.3% | 5.9% | 5.1% |
| Real Earnings Growth | **2.2%** | 3.1% | 4.9% | -0.1% | 2.5% | 3.0% | 1.7% | 4.5% | -3.7% |
| P/E Expansion/Contraction | **0.6%** | -6.1% | 6.9% | 7.2% | -7.6% | -1.0% | 9.4% | -6.3% | 0.4% |
| Inflation | **3.0%** | 2.6% | 2.9% | 5.1% | 7.4% | 2.5% | 2.2% | 5.4% | -2.1% |
| Total | **10.4%** | 1.1% | 18.2% | 17.6% | 5.9% | 7.8% | 19.4% | 9.2% | -0.1% |

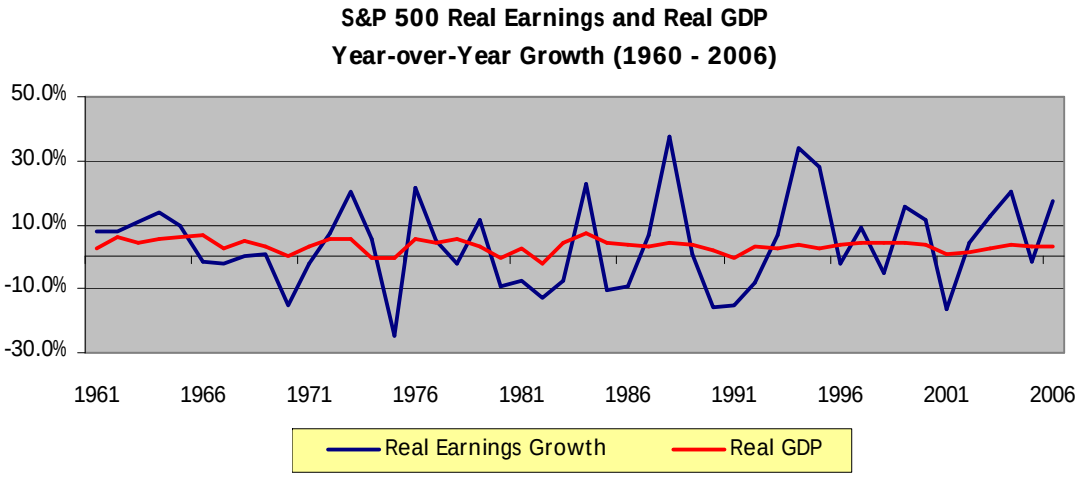
*Earnings model based on Ibbotson study. Source: Ibbotson, S&P, Haver, Robert Shiller, Morgan Stanley Equity Research. Note: returns add geometrically, not arithmetically. 2000-2006 figures are based on Ibbotson and Wurts estimates.*

# Large Cap US Equity Assumption

## Income Return Estimate

- Start with current 1.9% dividend yield for the S&P 500
- Expect payout ratio to rise, only 29% as of June 2007 (versus historical average of 48% since 1977)
- Expect dividend return of 2.4% from rising payout ratio



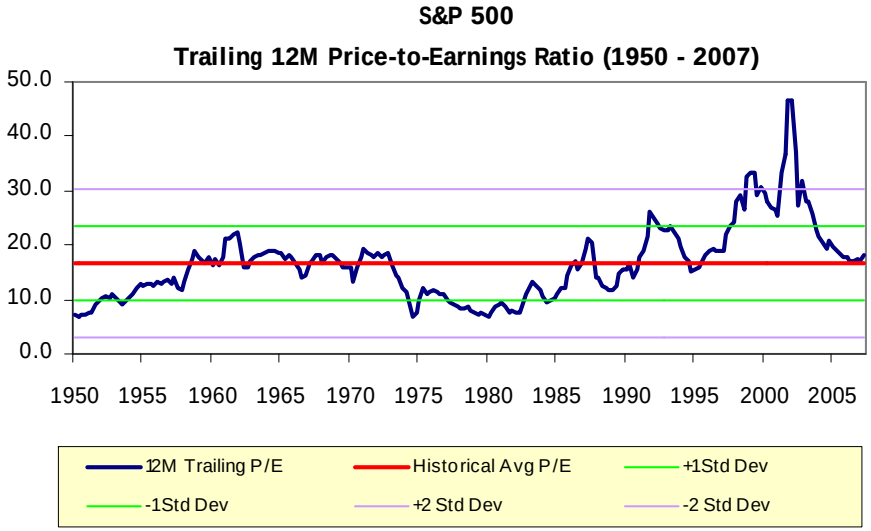

## Real Earnings Growth

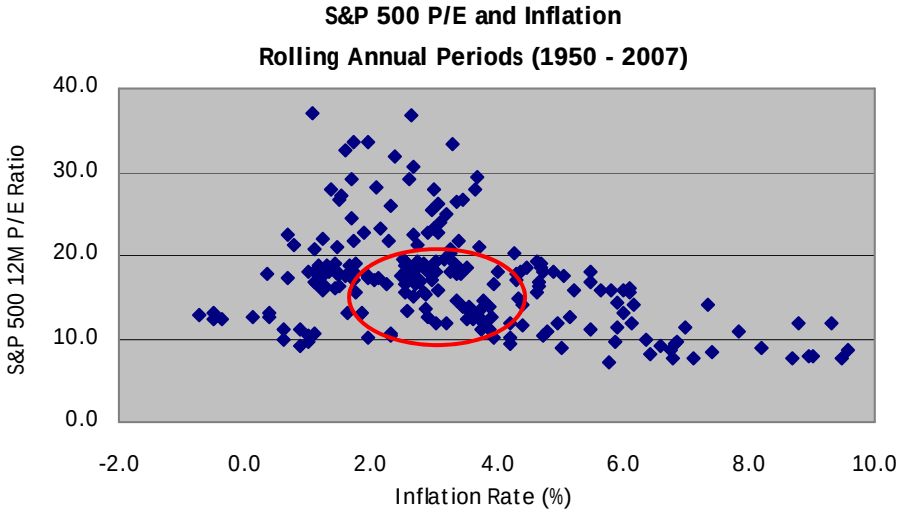
- Historically very volatile, dependent on health of economy
- Expect real earnings growth will average growth in real GDP
- Given US real GDP average growth of 3.1% from 1970-2006, we forecast real earnings growth of 3.1% over next ten years

*Source: Standard & Poor's*

# Large Cap US Equity Assumption

- Price to Earnings Expansion / Contraction
  - Volatile over history. Since reaching a record high in 2002, P/E ratios have compressed
  - S&P 500 currently trades at a multiple near its historical average of 16.5
- P/E's and Inflation
  - When inflation runs over 4% per year, P/E's typically reside between 10 and 20
  - During periods of low inflation, P/E's notoriously unpredictable (range from 10 to 40)
  - Based on current P/E levels and our forecast of moderate inflation, we forecast no impact from P/E contraction or expansion




*Source: Standard & Poor's, Ibbotson*

# Large Cap US Equity Assumption

Summing our component estimates equates to a ten-year forecast of 8.2% for large cap equities

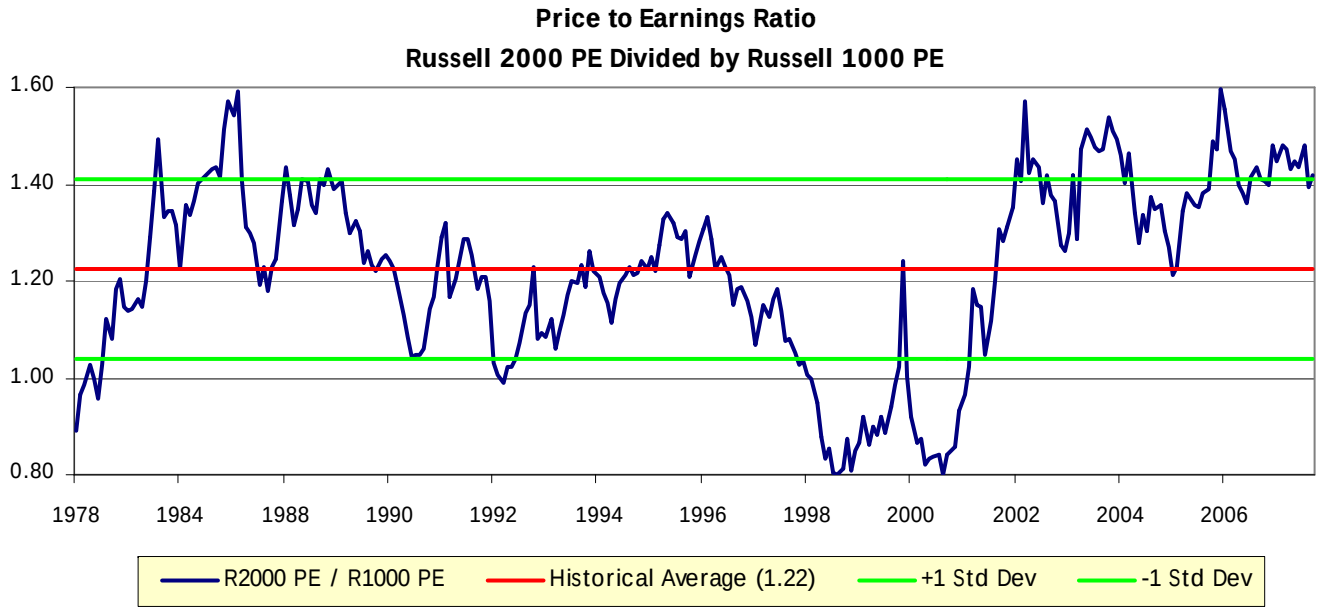
| S&P500 Return Decomposition | | | | | | |
|---|---|---|---|---|---|---|
| | **1926 - 2006** | 1970's | 1980's | 1990's | 2000-2006 | **2008 - 2017** |
| Income Return | **4.2%** | 4.1% | 4.6% | 2.6% | 1.7% | **2.4%** |
| Real Earnings Growth | **2.2%** | 2.5% | -0.1% | 4.9% | 3.1% | **3.1%** |
| P/E Expansion/Contraction | **0.6%** | -7.6% | 7.2% | 6.9% | -6.1% | **0.0%** |
| Inflation | **3.0%** | 7.4% | 5.1% | 2.9% | 2.6% | **2.7%** |
| Total | **10.4%** | 5.9% | 17.6% | 18.2% | 1.1% | **8.2%** |

- Also examined a dividend-discount model methodology with following assumptions:
  - Base 2007 operating earnings of $88 per share for the S&P 500
  - Earnings per share growth of 5.8% (sum of 2.7% inflation and 3.1% real earnings growth)
  - Average dividend payout ratio of 34% over next five years, increasing incrementally to 45% for years 6-10
- Based on these assumptions, our dividend-discount model forecasts an expected return of 8.2%, which is in line with our earnings-model based forecast
- Given 8.2% large cap equity forecast, we extrapolate an estimated equity risk premium of 4.2% (the difference of our large-cap equity forecast and current yield of 10-Year Treasury)

*Earnings model based on Ibbotson study. Source: Ibbotson, S&P, Haver, Robert Shiller, Morgan Stanley Equity Research. Note: returns add geometrically, not arithmetically. 2000-2006 figures are based on Ibbotson and Wurts estimates.*

# Small/Mid Cap US Equity Assumption

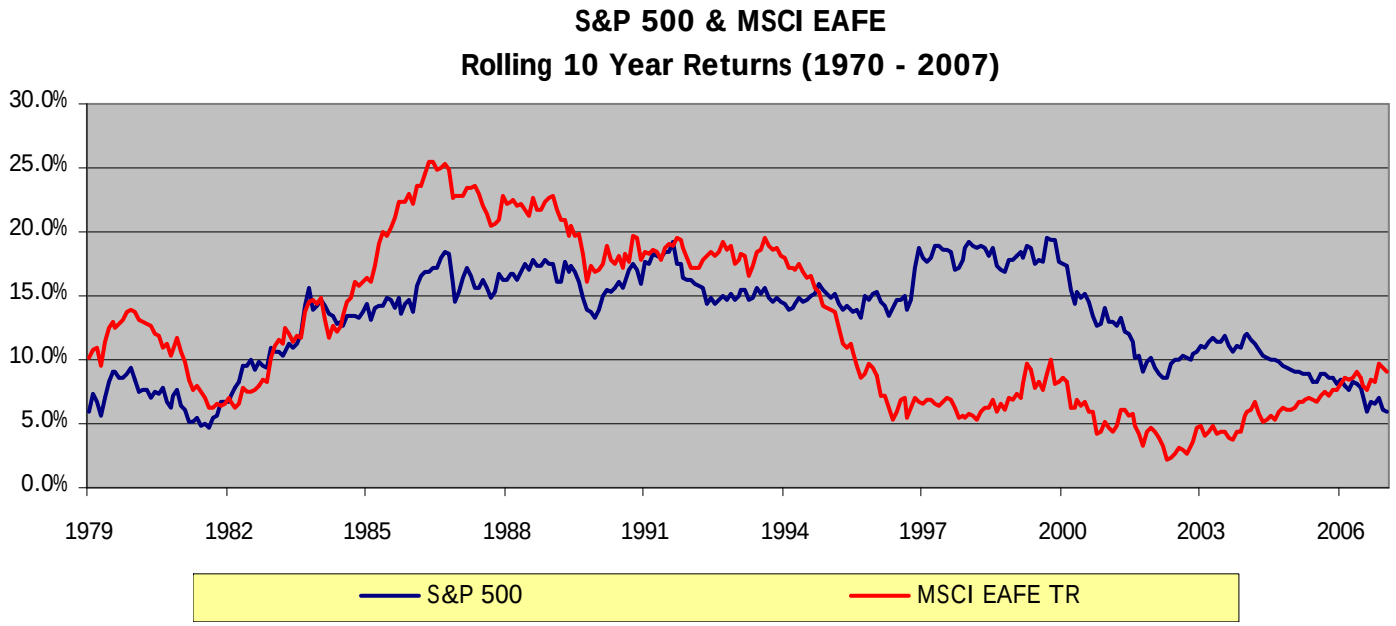
- We've reduced our small cap premium to 30 basis points over large caps (or 8.50%)
- Small caps are relatively expensive by historical standards
  - As of year-end 2007, Russell 2000 trades at 24.5 times trailing earnings, 42% higher than that of the Russell 1000
  - Small cap premium is 20% higher than historical average (based on compared to 22% historical premium), now a one standard deviation
  - Reversion to the mean dictates that the premium will shrink in the future




*Source: Frank Russell. Based on similar analysis from JPMorgan Asset Management, Guide to the Markets*

# International Equity Assumption

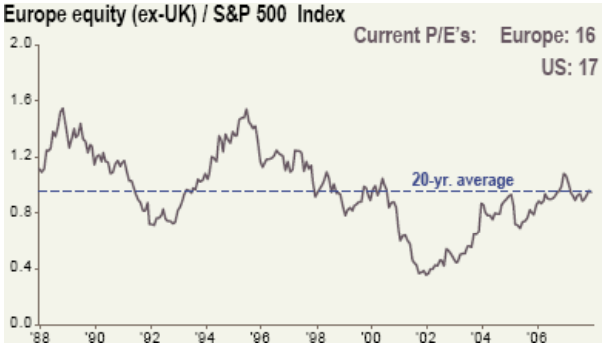
- When measured over ten-year periods, international stocks and domestic equities have demonstrated shifting leadership positions
  - When measured over 10-year periods, the average return premium for the S&P 500 relative to MSCI EAFE has been 1.04%.
  - Over the past ten years ending 2007, however, EAFE has outperformed by 313 basis points.
  - For our forecast, we utilize a building blocks approach using our large cap return as an anchor before adjusting for relative valuations

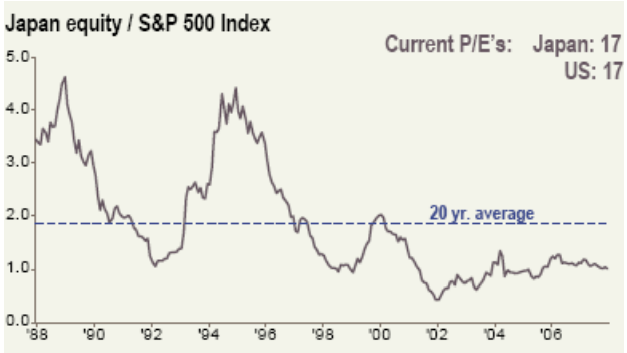



*Source: Ibbotson*

# International Equity Assumption

- Based on current price-to-earnings ratios of three primary international segments, we conclude that international equities are fairly priced.
  - The European (ex. UK) and United Kingdom are trading near their historical levels relative to the U.S. market while Japan trades at a steep discount
  - As of year-end 2007, MSCI EAFE index trades at a PE ratio of 13.63 relative to 18.65 for S&P 500.
  - Based on these findings, we estimate that international markets will maintain a slight premium of 50 basis points to the U.S. market, resulting in a total return forecast of 8.7%.

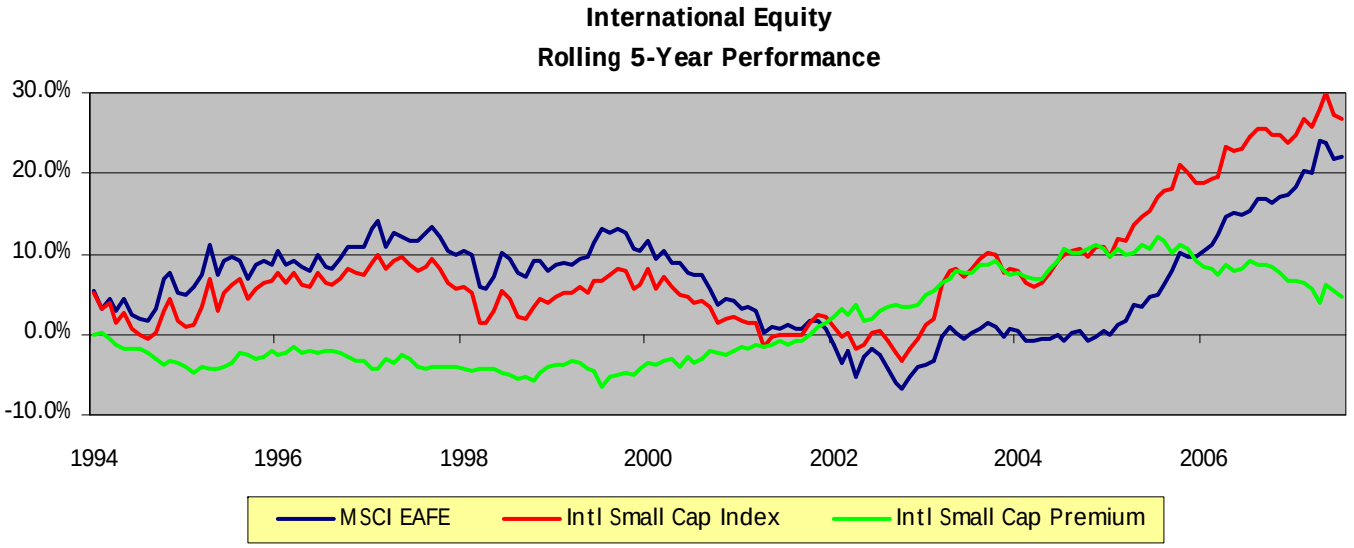




*Source: JPMorgan Asset Management, Guide to the Markets, Q1 2008*

# International Small Cap Equity Assumption

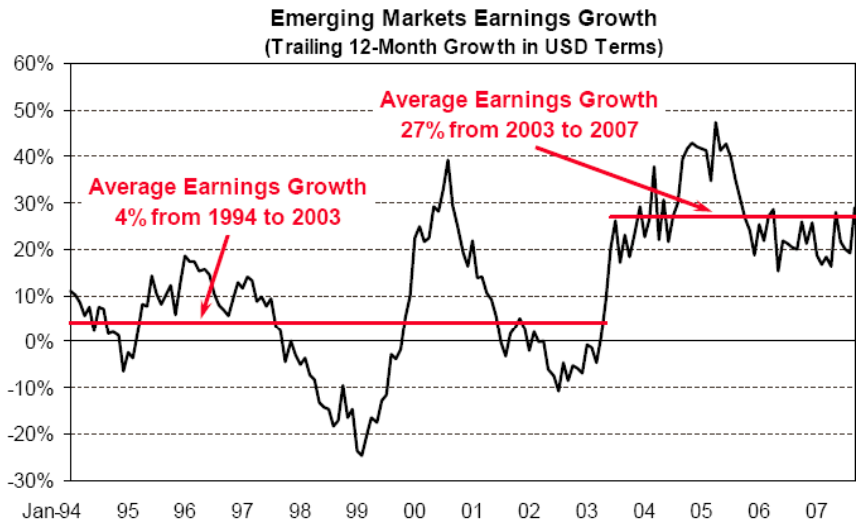
- Since the inception of reliable data in 1989, international small caps have typically earned a premium over their large cap brethren
  - Premium has averaged approximately 120 basis points over rolling 5-year periods since 1994
  - Given their strong recent performance, we estimate small caps will provide a lower premium over the next ten years
  - Five-year premium peaked in 2005 and is currently on a downward trend
- Therefore, we maintain a slight premium of 20 basis points over international large caps, resulting in a nominal return of 8.9%

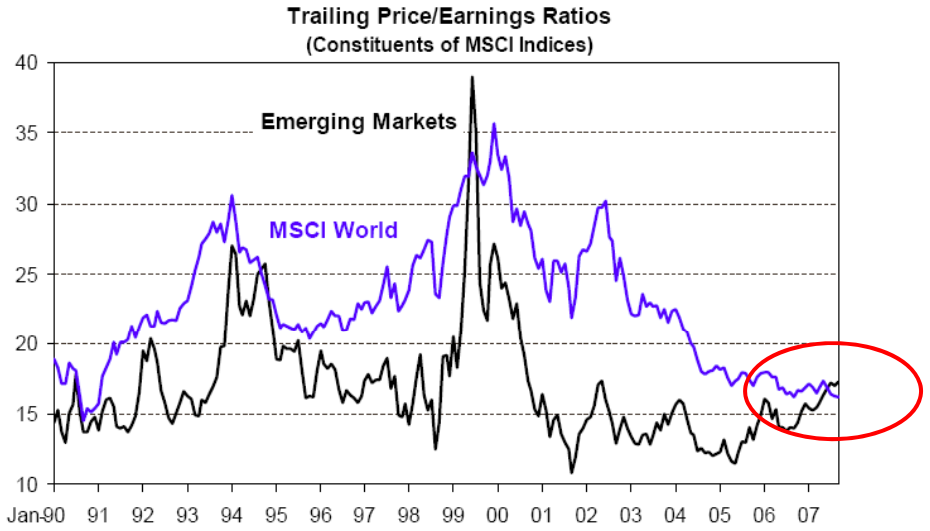



*Source: International Small Cap Index made up of S&P/Citigroup Extended Market Index World ex-US (7/1989 – 12/1998) and MSCI EAFE Small Cap (1/1999 – 12/2007) indices. Source: Ibbotson.*

# Emerging Market Equity Assumption

- Over the past three and five-year periods alone, the MSCI Emerging Markets index has returned 35.6% and 37.5%, respectively
- However, unlike past periods, returns were driven by earnings growth and economic activity
  - Recent earnings growth has been strong, averaging 27% from 2003 to 2007
  - Despite the extraordinary recent performance, the price to earnings ratio of emerging markets is still fairly reasonable relative to the MSCI World index

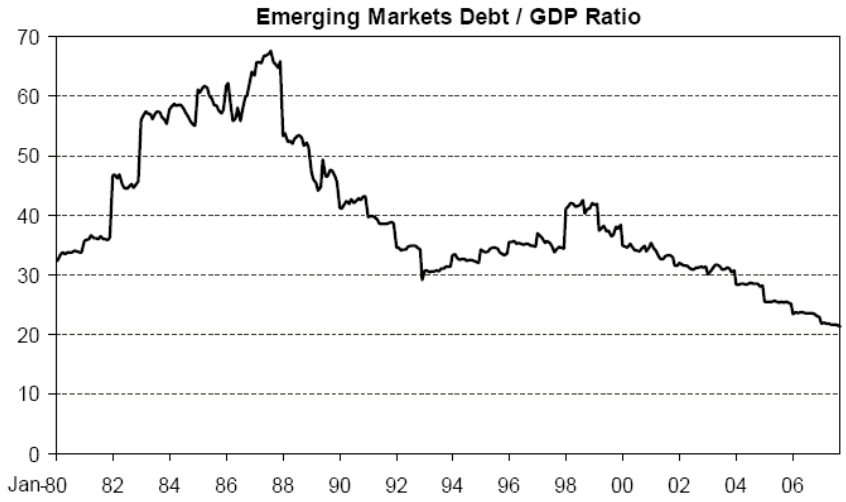


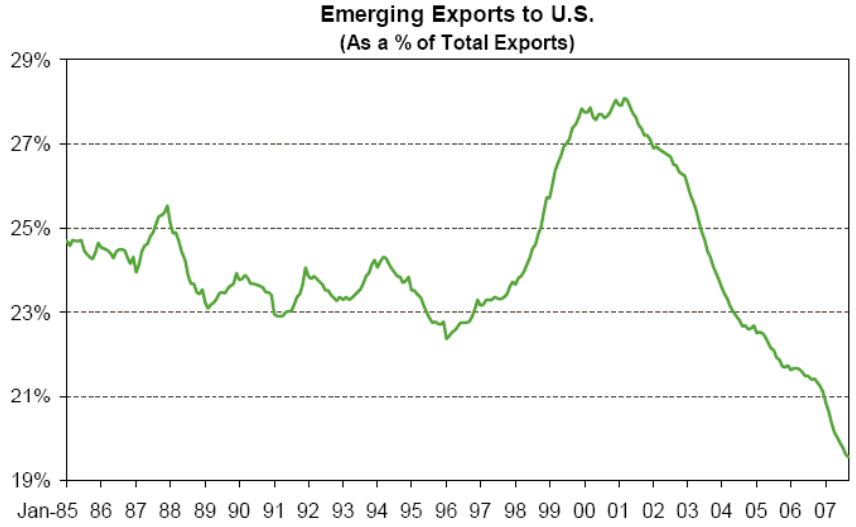




*Source: Grantham Mayo Van Otterloo, Ibbotson*

# Emerging Market Equity Assumption

- Emerging markets are also becoming self-sustainable
  - Since the turn of the century, the percentage of exports to the US has plunged from 28% to less than 20%, indicating less reliance on the U.S. for economic growth
  - National debt of emerging markets as a percentage of GDP has also fallen substantially from 40% in the late 1990's to about 20% today

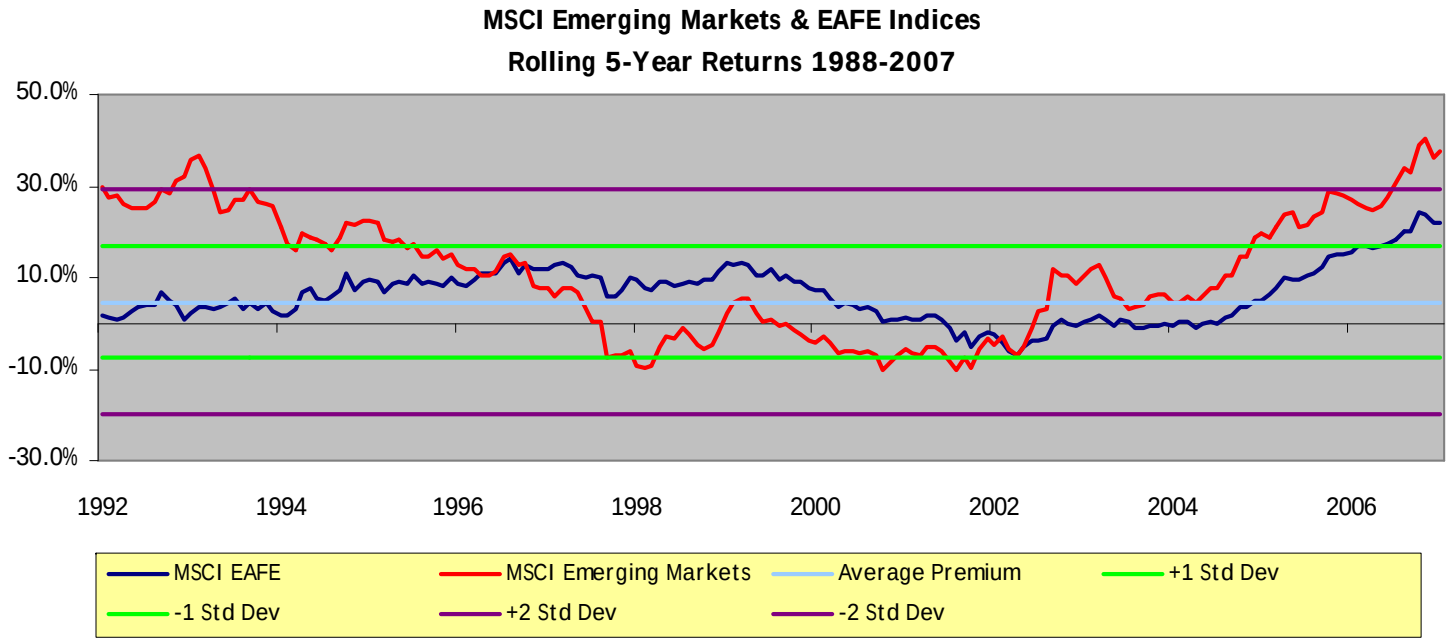



*Source: Grantham Mayo Van Otterloo*

# Emerging Market Equity Assumption

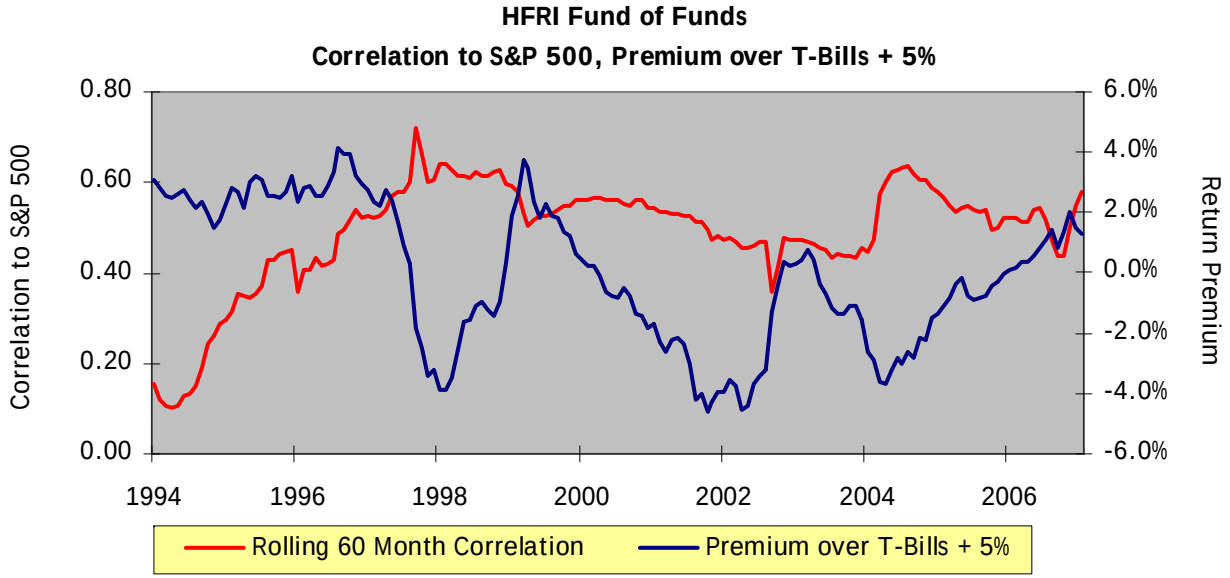
- Given the strong economic indicators, we continue to forecast a return premium for emerging markets relative to developed markets
  - Based on current valuations and the fact that emerging markets have become sufficiently integrated in the portfolios of institutional investors, we expect a premium of 80 basis points relative to international developed markets
  - Equates to a forecasted return of 9.5% over the next ten years.




*Source: Ibbotson*

# Hedge Fund of Funds Assumption

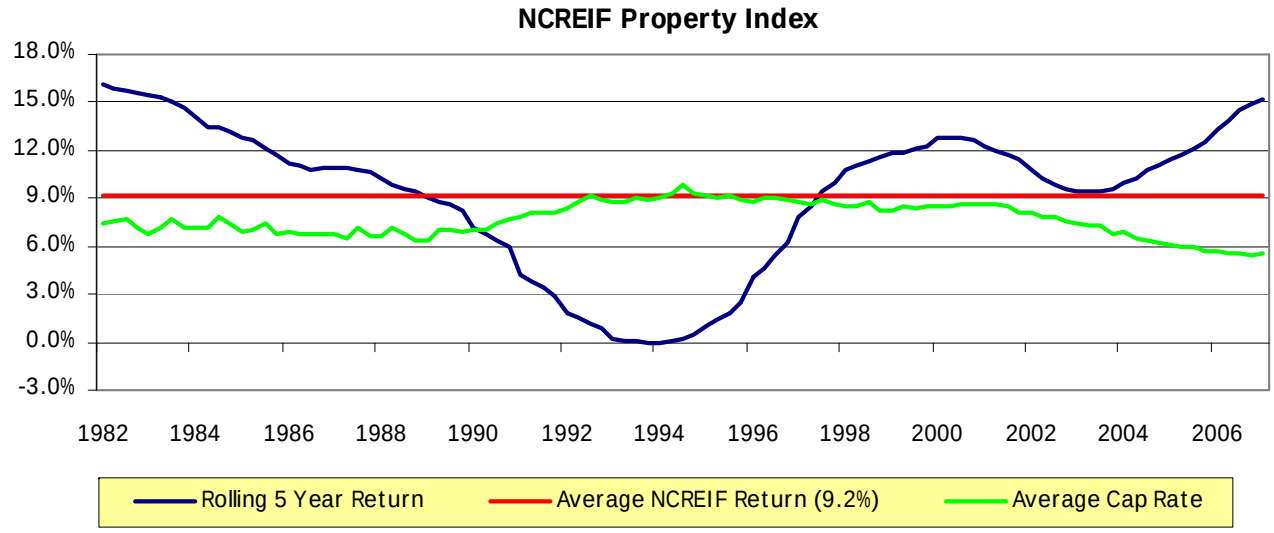
- Recent hedge fund performance illustrates correlations to equities has been rising
  - In 1994, the rolling 60-month correlation to the S&P 500 was only 0.10, now nearly 0.60
  - Tremendous growth in assets plays a significant role in the rising correlation as hedge fund managers are finding fewer opportunities to invest in the market place
- Hedge funds performance is lagging a T-Bills + 5% benchmark
  - Since 1998, hedge funds underperformed a T-Bills + 5% benchmark during *65% of rolling 5-year periods*
- Given trends in the hedge fund industry, we conclude that 3.50% spread over cash is a reasonable conservative estimation of returns for hedge fund of funds, resulting in forecasted return of 7.50%




*Source: Ibbotson, PIMCO, Independent Consultant Cooperative (ICC)*

# Private Real Estate Assumption

- Wurts' return for private real estate is 6.5% over next ten years
  - NCREIF Property index has returned an annualized 15.2% over the past five years ending December 2007 (nearly 6% higher than historical average)
  - Recent returns have been driven by historically low cap rates as well as strong demand for commercial property from institutional investors.
- We believe future returns will be lower due to:
  - *Cap rate expansion:* historically, cap rate compression has served as a tailwind
    - Steadily declining since peak of 10% in 1995, boosting returns (NCREIF averaged 12.4% return from 1995-2007)
    - During the 1990 to 1995 timeframe, when cap rates expanded, real estate was flat at 1.17%.
    - Based on current cap rates at historic lows, we believe that expansion is forthcoming




*Source: National Council of Real Estate Investment Fiduciaries (NCREIF), Ibbotson*

# Private Real Estate Assumption

- Based on our assessment of higher cap rates, vacancies and lower transaction volume, we expect real estate returns to average 6.5% over the next ten years for an unlevered core real estate portfolio
  - Because we do not consider leverage in our estimate, our assumption is admittedly conservative
  - Given the varying levels of leverage among core managers, actual returns may differ
- Wurts estimate is generally in line with the expectations institutional real estate managers
  - Over the intermediate term (i.e. 3-5 years), our survey found that investment managers expect core real estate returns to range from 6% to 10%
  - Our projection falls between our large cap equity and core bond expectations, which reflect our philosophy that real estate shares characteristics with both equities and fixed income

| Real Estate Manager | Return Forecast | Timeframe |
|---|---|---|
| ING Clarion | 8% | Next 3 years |
| RREEF | 6 - 8% | Next 5 years |
| Fidelity | 6 - 8% | Next 2 years |
| JPMorgan | 8 - 10% | Next 3 years |
| INVESCO | 6.75 - 8.25% | Next 5 years |
| Principal | 7 - 9% | Next 2 years |
| UBS Global Asset Mgt | 7.50% | Next 10 Years |

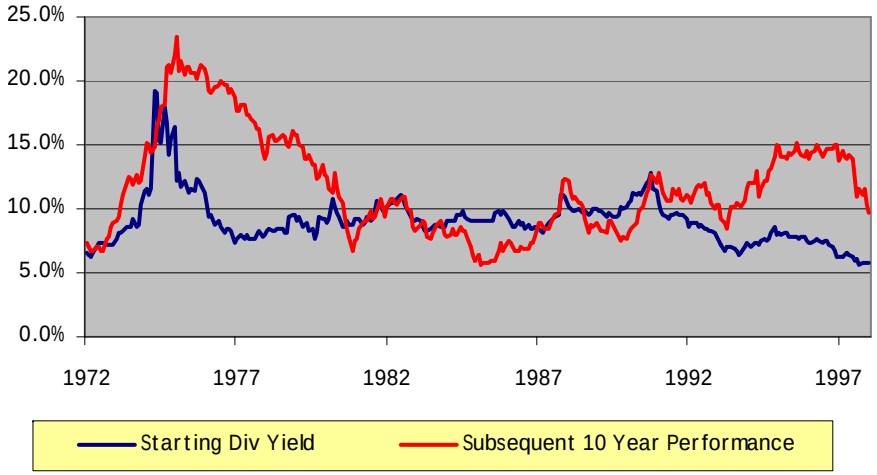
*Source: ING Clarion Partners, RREEF, Fidelity, JPMorgan Asset Management, INVESCO, Principal, UBS Global Asset Management*

# US Real Estate Securities Assumption

- Analysis of relationship between the starting dividend yield on the FTSE NAREIT US Real Estate index and subsequent 10-year performance
  - In some cases, falling dividend yields have resulted in lower 10-year returns (mid-1970's)
- Recent REIT performance has been driven by price appreciation.
  - Price appreciation has historically contributed only 23% of total REIT returns over five-year periods
  - Since 2003, returns from price appreciation have contributed to over 50% of total performance
    - Highest level of contribution since the early 1980's
    - Consistent with our assumption for private real estate, we expect transaction volume to ease

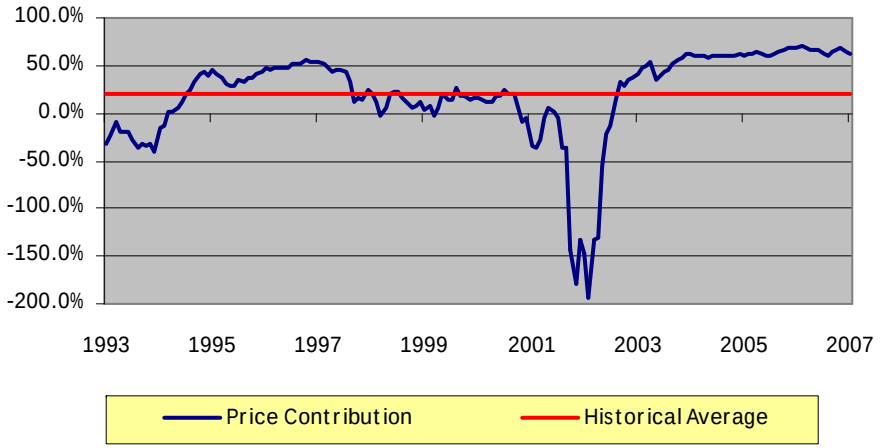
**FTSE NAREIT US Real Estate Index**

**Starting Divi Yield and Subsequent 10-Year Performance**




**FTSE NAREIT US Real Estate Index**

**Return from Price Appreciation (Rolling 5- Years)**

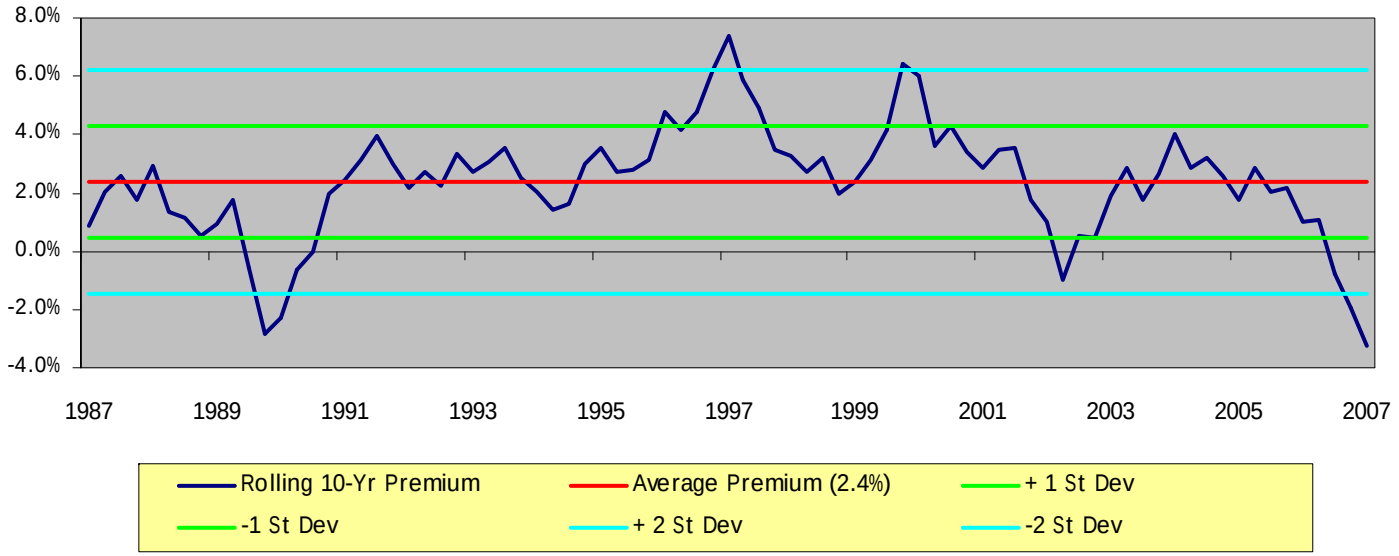



*Source: NAREIT, Ibbotson*

# US Real Estate Securities Assumption

- To derive a forecasted return for US Real Estate Securities, we use our core private real estate forecast as an anchor
  - Since inception of NCREIF Property index in 1978, REIT's have averaged ten-year premium of 2.37%
  - In the 10-year period ending September 2007, REIT's have underperformed core real estate by 328 basis points, a two standard deviation event
  - Based on current dividend yields and our expectation for less REIT price appreciation, we expect REIT's to provide a slight premium of 25 basis points to core real estate, resulting in total forecasted return of 6.75% over the next ten years

**FTSE NAREIT & NCREIF Property Indices**
**Rolling 10 Year Return Premium**

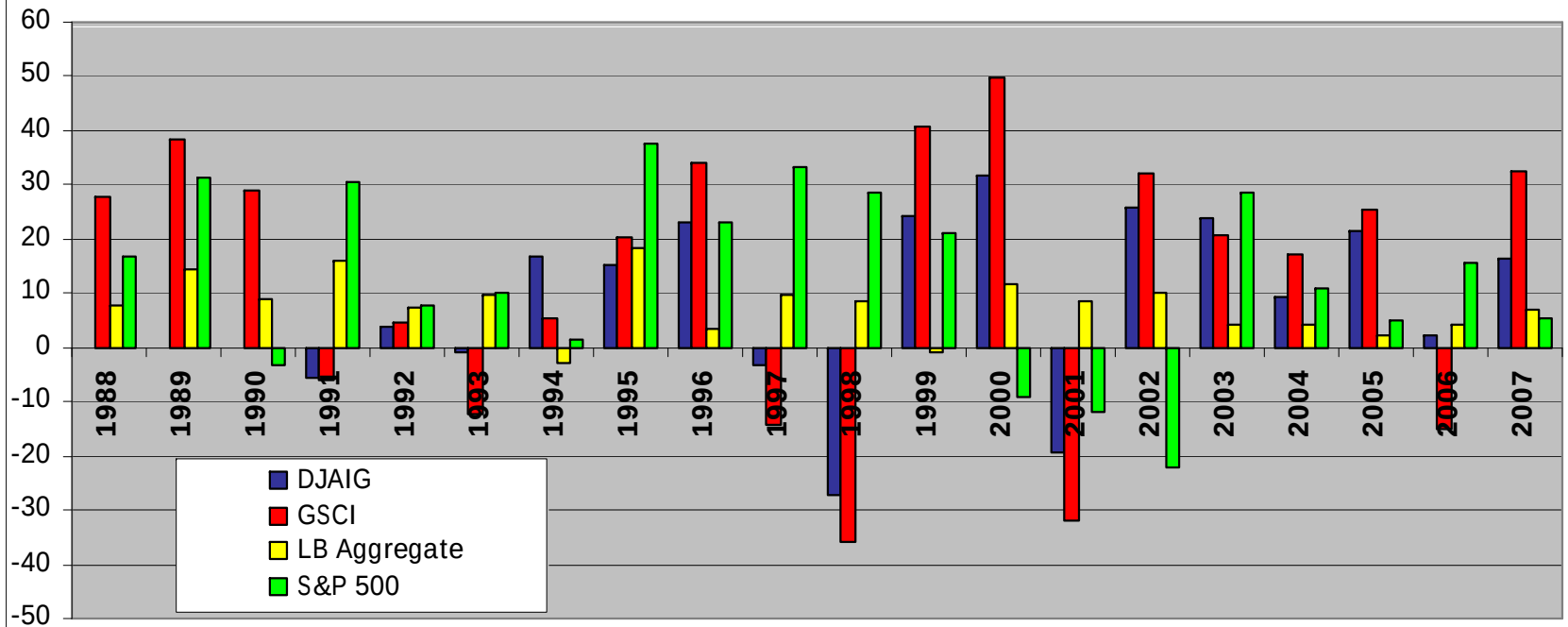



*Source: NAREIT, NCREIF, Ibbotson*

# Commodities: Diversification & Returns

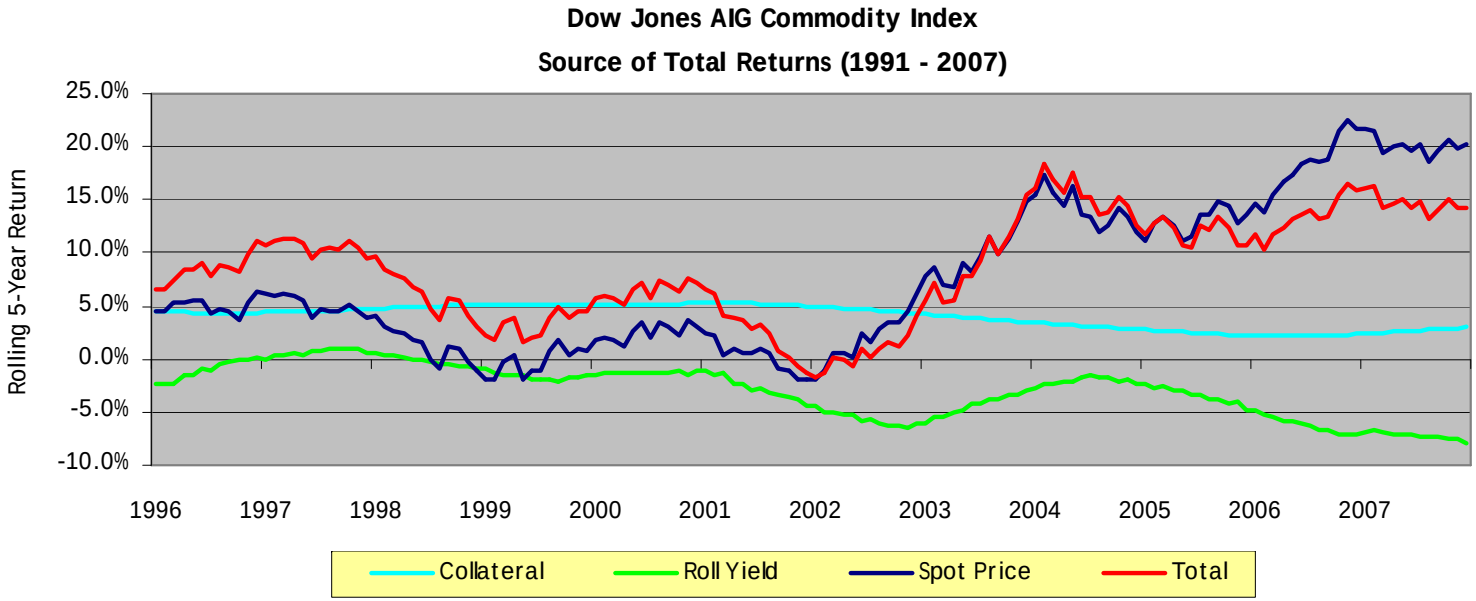
Commodities have seen equity-like volatility during the last two decades. While they provided much needed diversification in 2002 when equity markets were down, commodities had several years with significant negative returns including 2001.

**Annual Returns: Last Twenty Years**



# Commodities Assumption

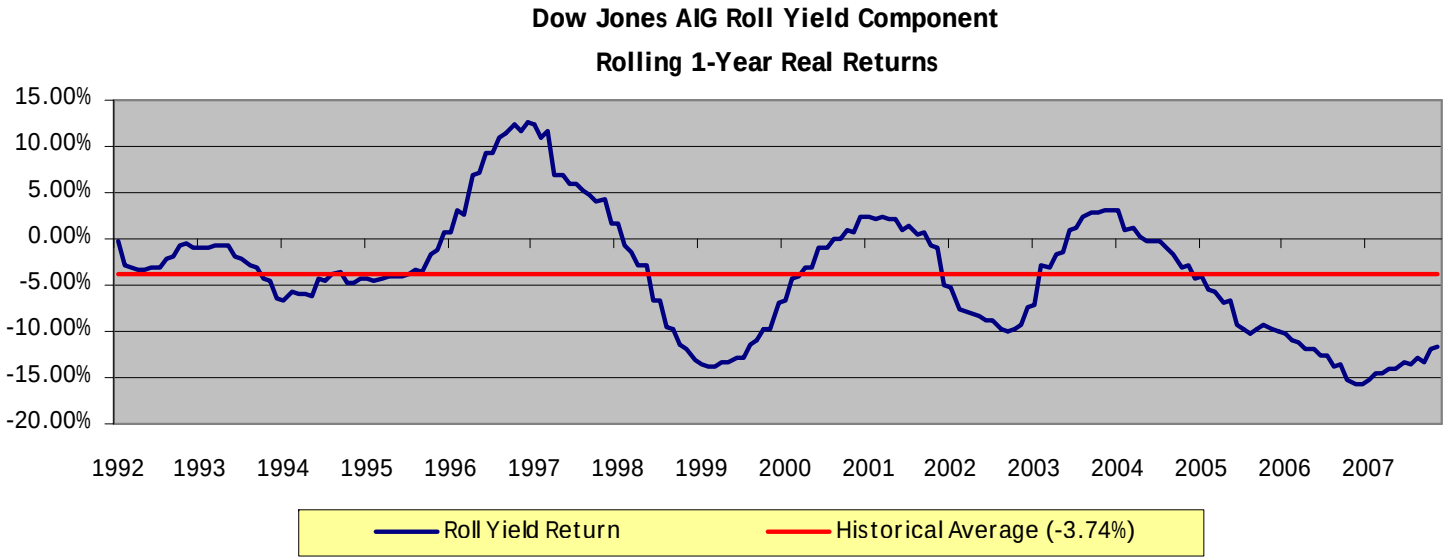
- Commodity investing has experienced tremendous growth over past decade
  - Total value of futures contracts outstanding for the S&P Goldman Sachs Commodity Index rose to $440 billion in December 2006 (increase of 100% since 2004)
  - For our analysis, we will utilize the Dow Jones AIG Commodity index due to its greater diversification relative to the S&P
- Three sources of commodity returns
  - Collateral return, roll yield return, and spot price return




*Source: Ibbotson, PIMCO, Wellington Management*

# Commodities Assumption

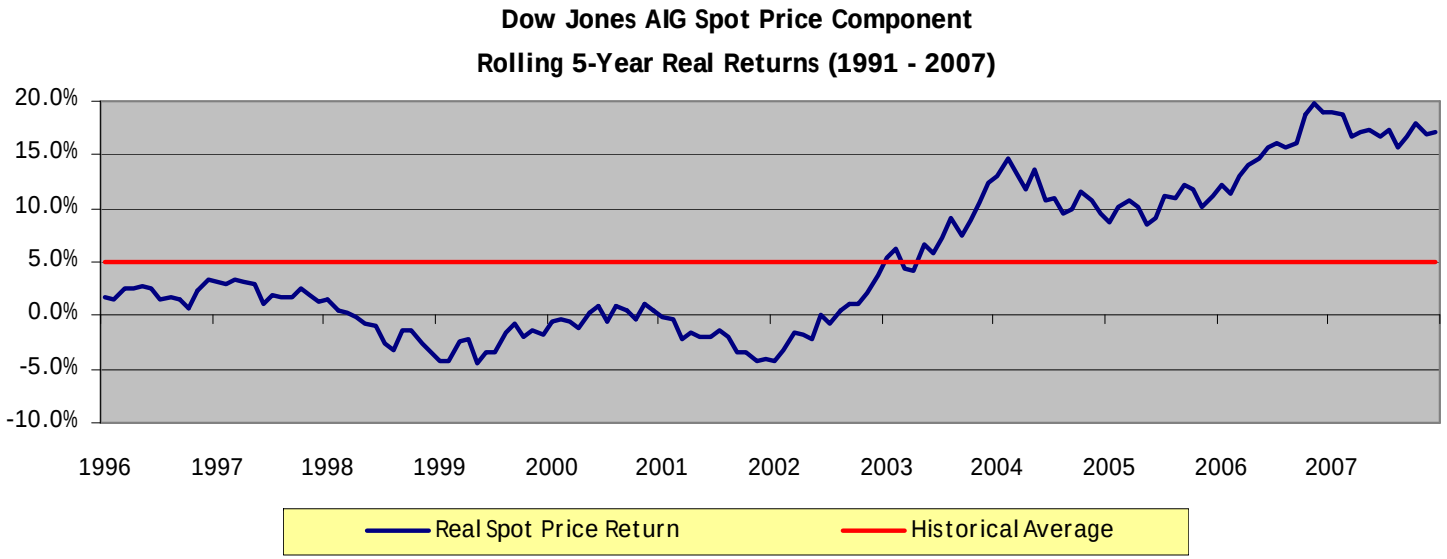
- Collateral Return Forecast
  - Least volatile component of commodity returns, collateral estimate of 4.0% based on cash forecast
- Roll Yield Forecast
  - "Rolling" of futures contracts can result in gains / losses due to shape of commodity futures curve
  - Since 1991, average 5-year return from roll yield has been -2.89%. Over one-year, average of -3.74%
    - Bigger losses over the past five years as volatility in spot prices has risen
    - Crude oil experienced an average negative roll yield of -21% in 2006
    - Given volatility of underlying segments (i.e. oil), we estimate contributions from roll yield of -2.0%




*Source: PIMCO*

# Commodities Assumption

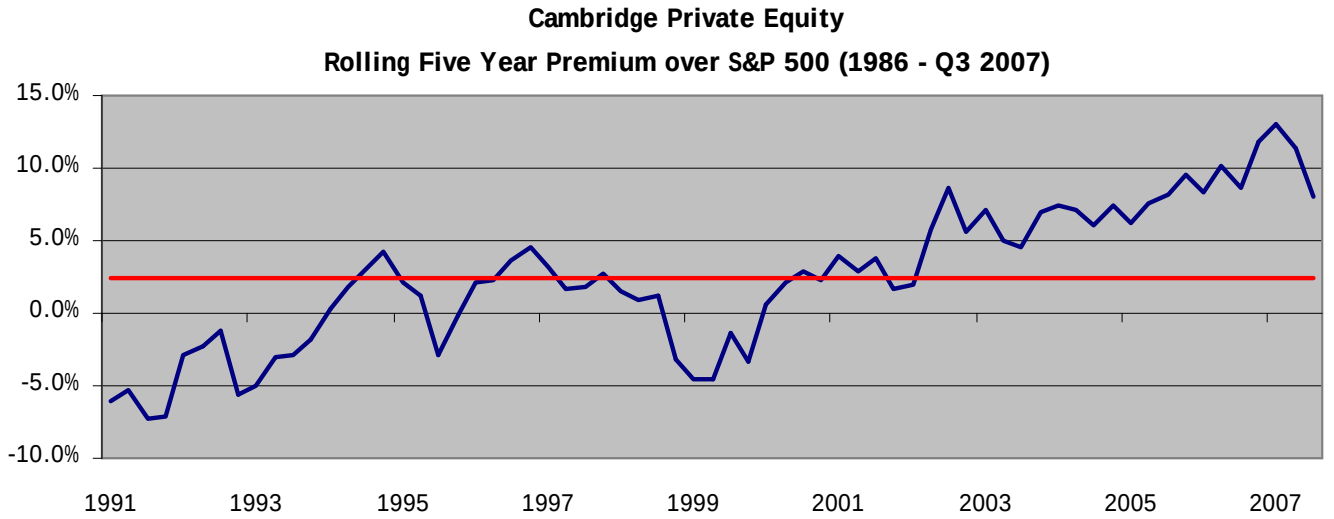
- Roll Spot Price
  - Changes in spot prices have historically been the largest contributor of commodity returns
    - 5-year return from spot prices (ending November 2007) exceeded that of the total commodity index
  - Going forward, advances in technology (e.g. drilling technology, new discovery of resources) and productivity gains should lower the cost of production, lead to decline in real price of commodities
  - Relative to U.S. inflation, spot prices have provided an average real premium of 4.9% over rolling 5-year periods since 1991
    - Going forward, we expect this premium to average 4.5% as technology and production advances will be somewhat offset by increased demand from emerging markets such as China and India.
- *Summing our three components results in a forecasted return of 6.5% for commodities*.




*Source: PIMCO*

# Private Equity Assumption

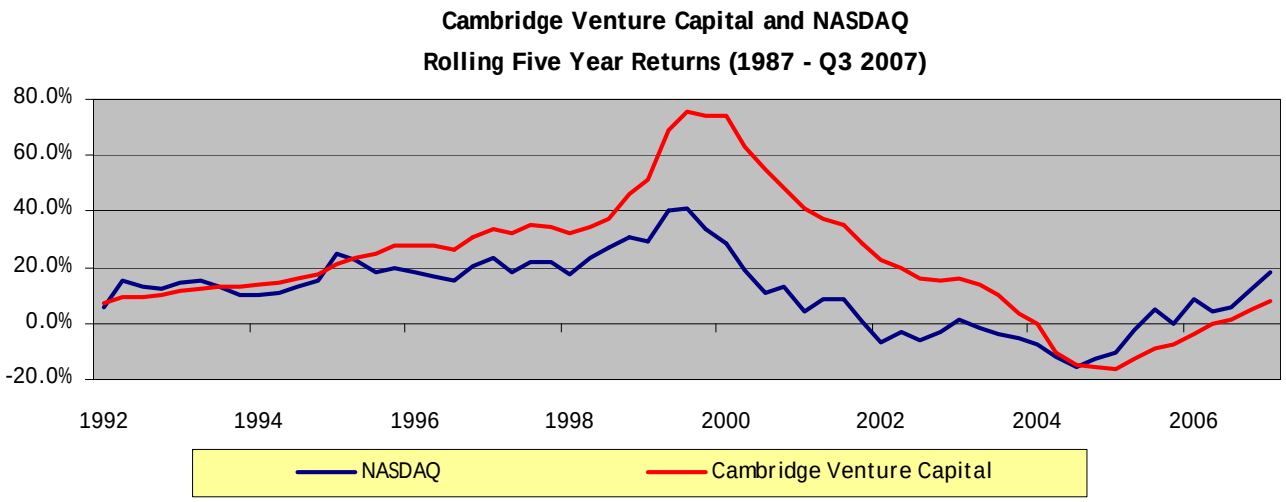
- Over the past ten years ending September 2007, private equity, as measured by the Cambridge Private Equity index, returned 14.9% and outperformed the S&P 500 by about 830 basis points
  - Since 1991, private equity (as measured by the Cambridge Private Equity index) has provided an average five-year premium over public markets of approximately 2.5% .
- In recent years, the performance differential has been even more dramatic, reaching 13% in March 2007 We expect private equity returns to revert to their historical average of approximately 2.5% over public markets.
- Thus we forecast a return of 10.7% for private equity over the next ten years




*Source: Ibbotson, Cambridge Associates*

# Venture Capital Assumption

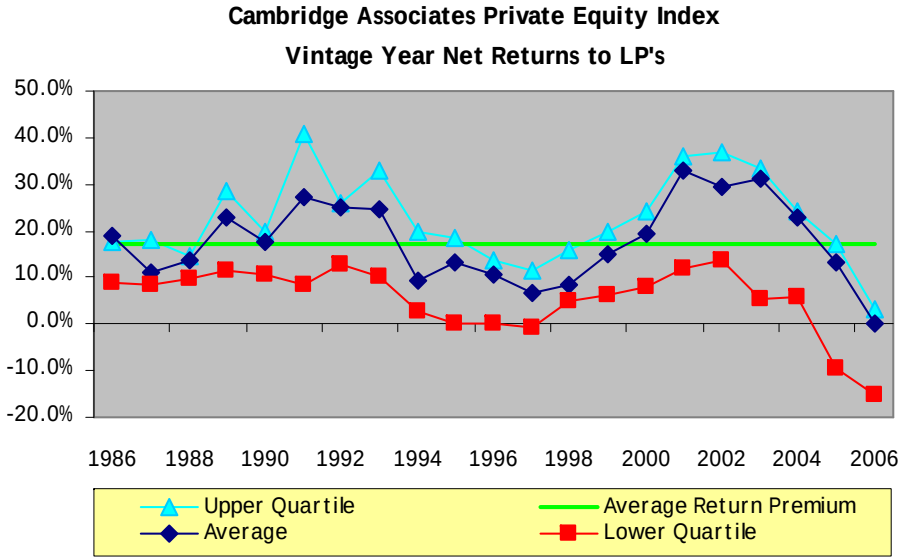
- Venture capital performance is highly dependent on strong public equity markets
  - NASDAQ stock market serves as a strong indicator of venture capital performance
  - From 1987 through Sept 2007, correlation of five-year rolling returns for NASDAQ and Cambridge is 0.75
- To determine return premium for venture capital, we use CAPM
  - ***E(r) = β ( Rm - Rf ) + Rf )***
  - Estimate beta of 2.5
  - *E(r) = 2.5 (8.20 – 4.0) + 4.0 = 14.5%*
- Also examine historical performance
  - During five-year periods when public markets returned between -8% and 24% (one standard deviation around our large cap premium), median venture capital premium was approximately 6.0%
  - Based on these findings, we settle at our CAPM-derived forecast of 14.5% over the next ten years

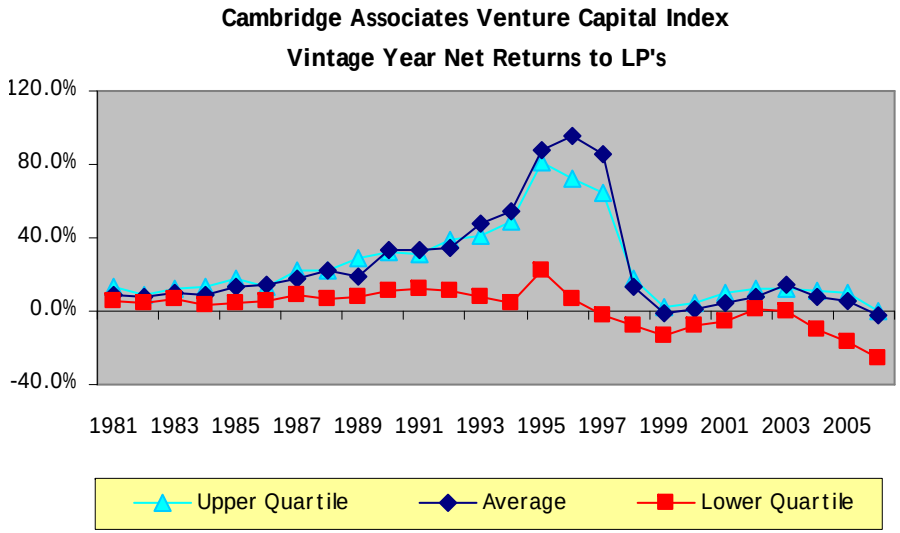



*Source: Ibbotson, Cambridge Associates*

# Private Equity / Venture Capital

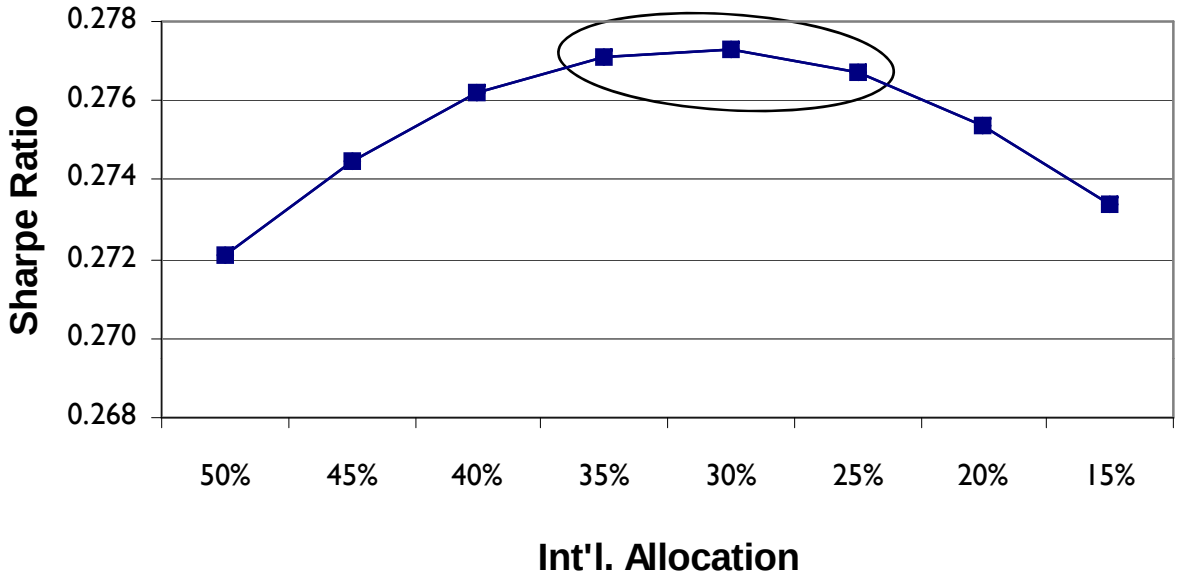
- Most important determinant of successful private equity investing is having access to top-tier professionals
  - Average return differential between top and bottom quartile managers within the Cambridge Private Equity index was 17% based on vintage year funds from 1986 through 2006
  - For venture capital, difference between top and bottom-quartile performers has average 23% (based on vintage year funds)
  - In some cases, returns of a few top-tier managers helped to boost the total return of the index while bottom quartile managers performed poorly




*Source: Cambridge Associates*

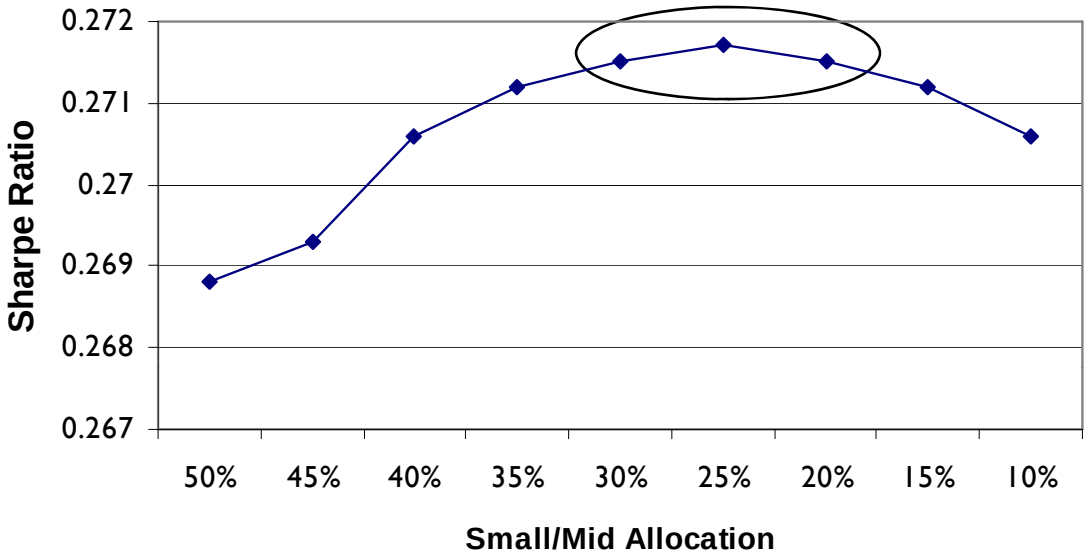
# International Constraint




- International allocations between 25%-35% percent exhibited the highest Sharpe ratios. Sharpe ratios were obtained by evaluating portfolios containing large and small/mid cap stocks (Russell 3000) and international stocks (MSCI EAFE) with different weights starting from Jan 1979 to Dec 2006.

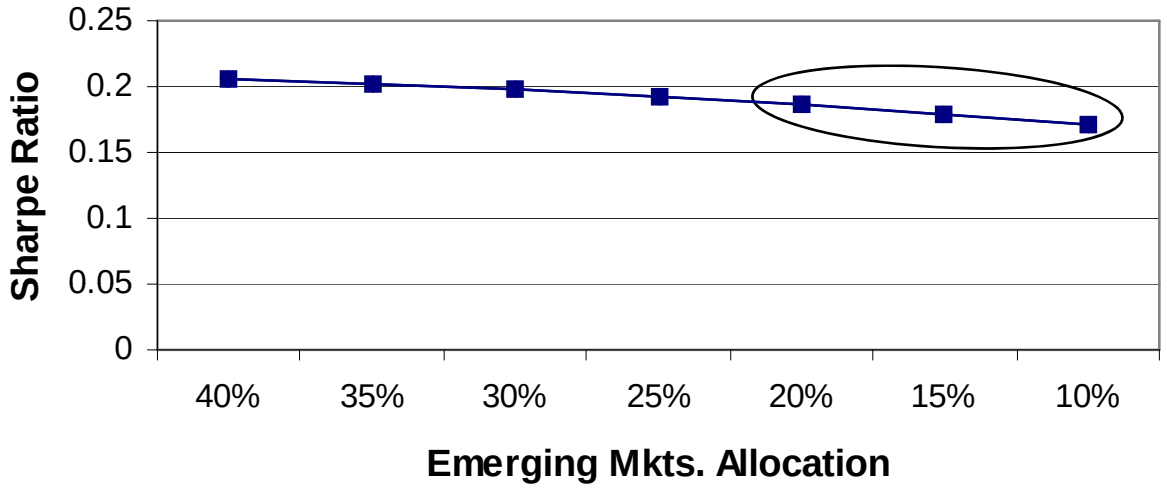
- FCERA's current policy has a 21% allocation to international equity. We constrained the international allocation to be between 25%-35% of the total equity allocation.

# Small Cap Constraint




- A 25% small/mid 75% large cap allocation exhibits the highest Sharpe ratio. Sharpe ratios were obtained by evaluating portfolios with varying combinations of large cap stocks (S&P 500) and small/mid cap stocks (Russell 2500) from Jan 1979 to Dec 2006.
- Small/mid cap stocks represent approximately 15% - 20% of the total domestic market. FCERA's small/mid cap allocation relative to the domestic equity allocation is currently 18%.
- We constrained the small/mid cap allocation to be between 20% - 30% of the domestic equity allocation.

# Emerging Markets Constraint




- Adding emerging markets to the portfolio increases return and standard deviation in a linear fashion.
- As of Dec 31, 2006 13% of the MSCI All Country World ex-U.S. Index was made up of emerging markets securities. FCERA current Emerging Market exposure is 20%.
- We constrained emerging markets to be within 10% - 20% of the total international portfolio.

# Value Added & Opportunistic Real Estate

Real Estate has been recognized as an institutionally investible asset class for over three decades now. "Core" real estate is included in institutional portfolios primarily due to the diversification benefits of this asset class, but also the significant and stable cash flows and inflation hedging characteristics.

Over the past several decades, the opportunity set for institutional investors has expanded beyond high quality "core" to categories that have been loosely defined as "value added" and opportunistic."

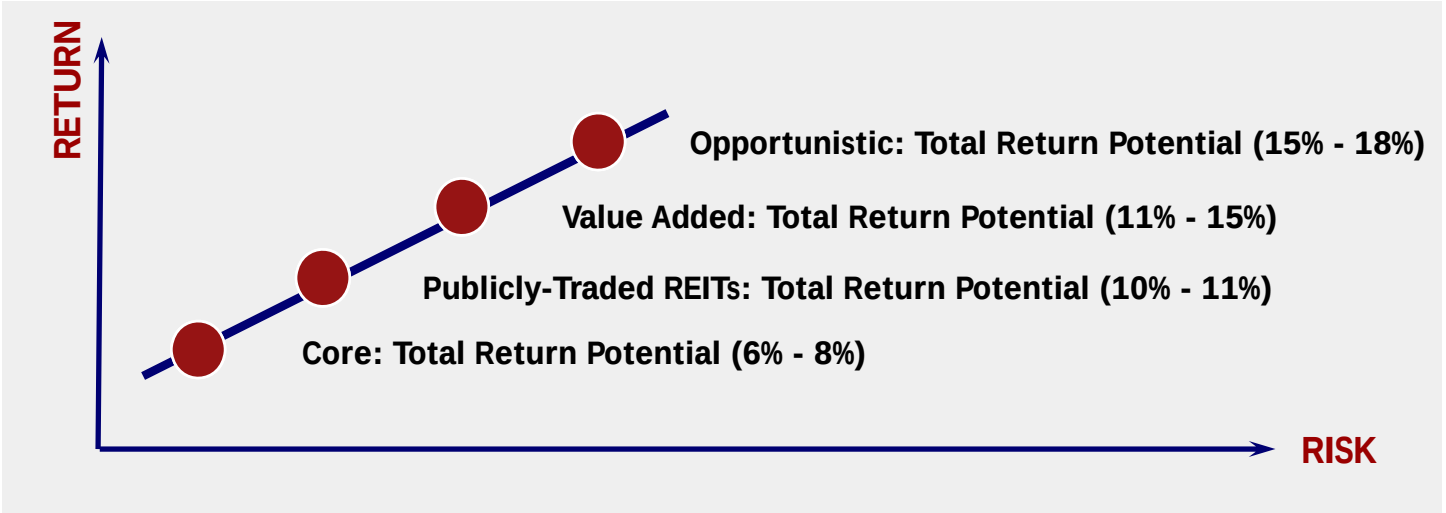
*Cross Tower, Shanghai, China*
*Source: Goldman Sachs Whitehall 2001*

*210 watermark, Tampa, Florida*
*Source: TA Associates Fund VIII*

# Return Characteristics

While Core Real Estate provides stable cash flows, Value-Added and Opportunistic Real Estate strategies focus on capital appreciation.

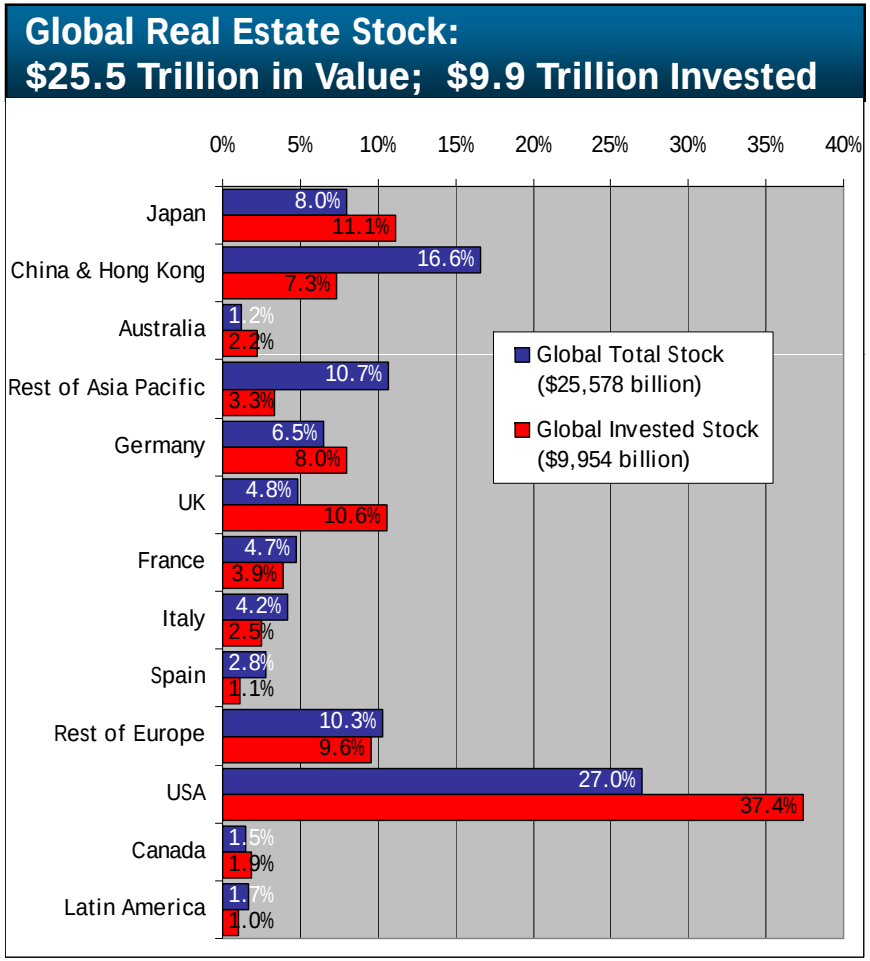
| Core | Value-Added | Opportunistic |
|---|---|---|
| • 70% to 80% of return from income<br>• Bond-like<br>• Low correlation with other major assets<br>• Inflation sensitive income<br>• NCREIF is benchmark | • 50% of return from income<br>• Appreciation gains mostly realized at disposition of properties.<br>• Initial cash flows may be negative ("J-Curve")<br>• No benchmark exists | • 20% or less of total return from income<br>• Appreciation drives returns, realized at disposition.<br>• Initial cash flows may be negative ("J-Curve")<br>• No benchmark exists |




*Source: RREEF*

# Global Diversification

- International or Global real estate strategies tend to fall in the "Opportunistic" category
- The USA comprises over one-third of the total *investible* global real estate market, although it comprises only 27% of the estimated total value
- International markets have started to see the institutionalization of commercial real estate markets
- Emerging countries such as China and India are seeing tremendous development in their commercial properties




*Source: JPMorgan Asset Management "Risks, returns and correlations for global real estate markets" by Nick Tyrrel, October 2007, based on data from DTZ, EPRA and JPMorgan.*

# Investment Examples

## Value Added Example

- Invesco Real Estate Fund II, LP - Ellicott House *(Purchase closed 5/2007)*
- Multi-family rehab / renovation
- In-place rents are +/-50% below market
- Units require significant interior work
- Good location – Washington DC neighborhood


*Source: Invesco*

## Opportunistic Example

- Penn Square Global Real Estate Fund I, investment in Carlyle Europe Real Estate Partners III
- Stockholm, Sweden
- 18,390 square meter office acquisition
- Property currently vacant
- Consists of two office buildings that will undergo refurbishment and substantial re-tenanting.

*Source: Penn Square Capital, Townsend Group, Carlyle Europe*

# Risks to Investing Beyond Core Real Estate

- Market risk – failure to lease vacant properties
- Construction cost risk
- Liquidity risk
- Interest rate risk
- Currency risk
- Timing
- Higher volatility of returns
- No standard benchmark
- Manager skill more important
- J-curve

# Implementation Considerations

- Given the lack of historic returns and the "J-curve" shape of returns, Value-added and Opportunistic Real Estate don't lend well to mean-variance asset allocation modeling.
  - It may be reasonable to use the leverage amount as a factor to increase the expected risk and return for one of these strategies. However, how these strategies correlate with core real estate or other traditional asset classes cannot be forecast.
- There is no standard benchmark or peer universe for comparing managers' returns.
  - Some institutional investors use NCREIF Property Index + 3% or 5%
- Given the closed-end nature of Value-Added and Opportunistic funds, and the timing implications, it may be prudent to build a strategy that provides for vintage year diversification as well as property-type and regional diversification. This is similar to a private equity approach.
- Since the closed-end funds will often begin distributing capital before your full commitment has been called, it may be prudent to commit more than your targeted amount in order to achieve your desired allocation. Again, this is similar to a private equity approach.

# Infrastructure Sub-Sectors

- Core Infrastructure assets share some of the following qualities:
  - Essential service to the community
  - Strategic competitive advantage (monopolistic)
  - Hard, physical, long-lived asset

- Sectors:

| Throughput | Regulated | Contracted | Social |
|---|---|---|---|
| •Roads | •Electricity Distribution | •District Energy | •Hospitals |
| •Tunnels | •Electricity Transmission | •Power Generation | •Aged Care |
| •Bridges | •Gas Distribution | •Communications Towers | •Schools |
| •Airports | •Water Distribution | | •Courthouses |
| •Rail Links | | | •Prisons |
| •Ports | | | |

*Source: Macquarie*

# Why Infrastructure?

- Public-private partnerships allow for greater private sector participation in projects and services that are typically delivered by the public sector.
- In theory, the public sector benefits from these arrangements because costs may be contained (i.e. budget over-runs are the private entity's problem) and the administrative burden is reduced. In addition, some believe the private sector is able to build infrastructure more efficiently and cost effectively than the public sector.
- Long-Term investors are attracted to Infrastructure for:
  - Long durations (maturity) match investment horizons of pensions, endowments and foundations
  - Revenues are predictable over a longer term
  - Infrastructure assets typically experience demand irrespective of variations in the economic cycle (i.e. low correlation to traditional assets)
  - Inflation protection, as toll road concessions typically have a stipulated inflation component in the tolling regime; regulators often specifically incorporate inflation as one of the 'building blocks' of the regulatory decision.

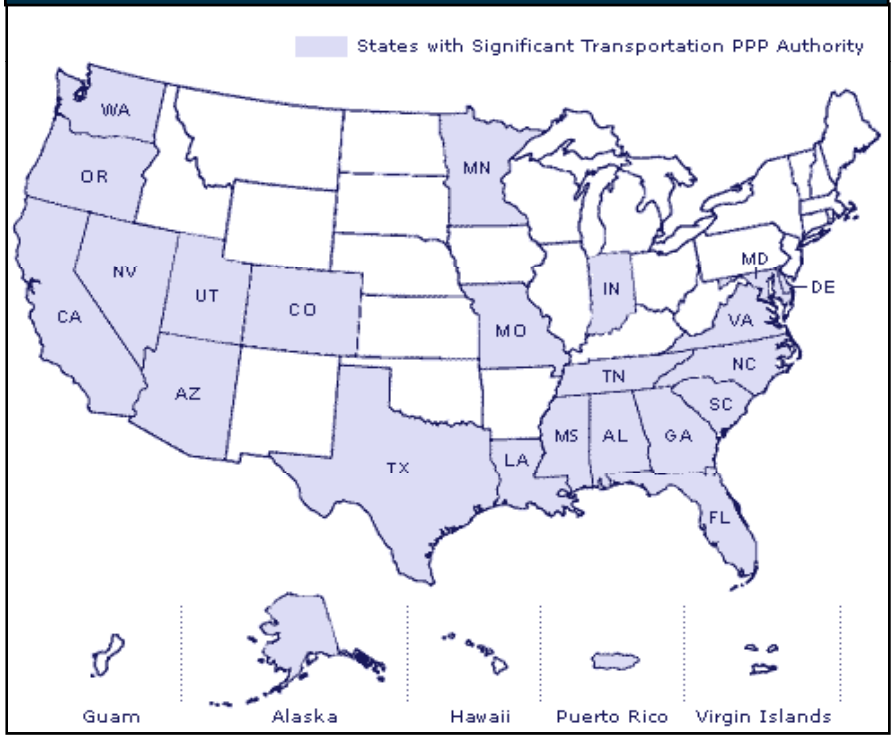
*Source: Wurts & Associates, Macquarie*

# Infrastructure Marketplace

The United States is an emerging opportunity set for infrastructure investing.

- 23 states have enacted PPP statutes for the development of transportation infrastructure
  - *Federal Highway Administration*
- There is a $1.6 trillion deficit in needed infrastructure spending through 2010 just for repairs and maintenance.
  - *American Society of Civil Engineers*
- There is an estimated shortfall of $300 to $500 billion for maintaining and improving wastewater infrastructure over the next 20 years
  - *Environmental Protection Agency*
- The Highway Trust Fund, established in 1956 to maintain and improve the condition and performance of the Nation's highway and transit systems, is projected to be bankrupt in 2009 unless federal gas taxes are raised.
  - *CBO, National Surface Transportation Infrastructure Finance Commission*

**States with Public-Private Partnership (PPP) Authority**

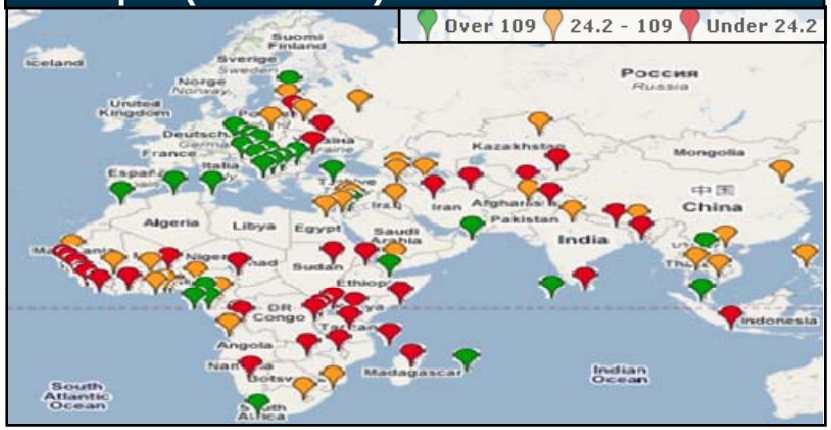



*Source: U.S. Department of Transportation, National Surface Transportation Infrastructure Finance Commission*

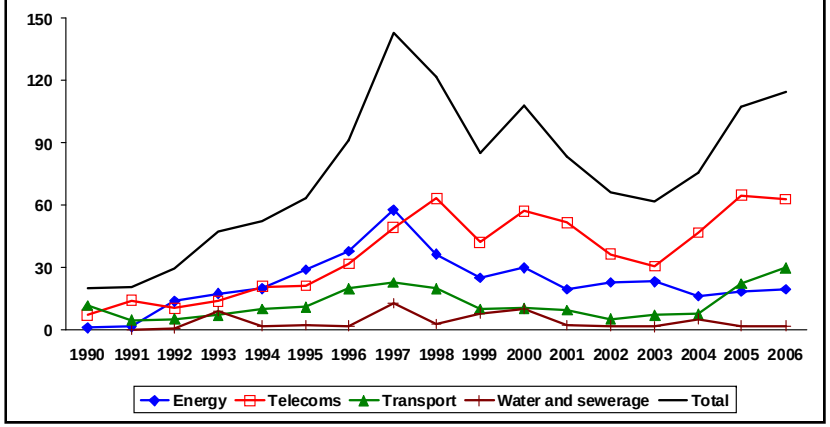
# Infrastructure Marketplace

- Infrastructure investing is a global opportunity. Both developed and developing countries have been using PPP models for over 20 years. France, England, Germany, Canada, Italy, Ireland, Japan, Russia, China… and yes, the United States.
- In 2006, an estimated $9.2 billion in new PPP projects were closed in the Western Hemisphere, representing 14% of the total PPP projects worldwide (over $70 billion).
  - *PriceWaterhouse Coopers*
- Investment commitments in low- and middle-income countries grew by 10% to $114 billion in 2006, just 20% below the 1997 peak. Telecommunications continues to be the largest component of investment in these countries.
  - *The World Bank Group, Public-Private Infrastructure Advisory Facility*

**Total $ Value of Private Investments Commitments Per capita (Last 5 Years)**




**Investment commitments to PPI projects in developing countries by sector, 1990-2006**




*Source: The World Bank Group – Public-Private Infrastructure Advisory Facility, Private Participation in Infrastructure Database*

# Infrastructure Return Drivers

Return Drivers:

- Cash flow yield, typically inflation- or GDP growth- related
  - Regulated Utilities – regulatory pricing formulas specifically allow for an inflation-related adjustment
  - Toll Roads – where a pricing mechanism is defined in a concession, it typically contains a reference to the level of inflation
  - Airports – aeronautical charges (majority of an airport's revenues) make allowance for an inflation adjustment
- Appreciation, depending upon asset stage
  - Late stage – modest
  - Early stage/development - high

Returns Are Realized Through:

- Tolls or lease payments
- Sale of asset

# Infrastructure Risks

- The volatility of infrastructure is often compared to the volatility of private commercial real estate.
- The risk characteristics are more similar to private equity investing.
  - Deal risk
  - Operational risk
  - Regulatory risk
  - Construction & development risk
  - Liquidity risk
  - Demand & usage risk
  - Interest rate risk
  - Inflation risk
  - Environmental risk

**Potential of active management on risk and return characteristics**

| | Toll road* | Merchant utility | Regulated utility | Airport |
|---|---|---|---|---|
| **Revenue growth** | ✓✓✓ | ✓✓✓ | ✓✓ | ✓✓✓ |
| **Pricing certainty** | ✓✓✓✓ | ✓ | ✓✓✓ | ✓✓ |
| **Predictable yield** | ✓✓✓ | ✓ | ✓✓✓✓ | ✓✓✓ |
| **Customer diversity** | ✓✓✓✓ | ✓✓ | ✓✓ | ✓✓✓ |
| **Regulatory/market risk** | ✓ | ✓✓✓ | ✓✓ | ✓✓ |
| **Primary value driver** | Traffic is GDP correlated | Market pricing risk | Regulated price and cost formulae are reset periodically | Traffic is strongly GDP correlated |

**Toll road carrying full traffic risk.*

*Source: RREEF Infrastructure*

# Private vs. Public Infrastructure Investing

While most common references to infrastructure imply private investments, infrastructure is available in two formats: listed and unlisted.

| Unlisted (Private) | Listed |
|---|---|
| Direct investments in infrastructure assets or operating companies | A portfolio of listed securities of infrastructure companies |
| Advantages:<br>• Low volatility (higher risk-adjusted return)<br>• Low correlation with traditional markets | Advantages:<br>• Quicker access to investments<br>• Greater liquidity<br>• Exposure to broader range of assets<br>• Better benchmarking<br>• Lower cost |
| Disadvantages:<br>• Investments are relatively scarce and illiquid<br>• Require significant capital outlays up front<br>• Long time for realization of cash flow<br>• No benchmark | Disadvantages:<br>• Higher volatility (lower risk-adjusted return)<br>• Higher correlation with traditional markets<br>• Some listed sectors have few constituents |

# Listed Infrastructure

- Listed infrastructure is estimated to comprise about 4.6% of the global equity markets.
- Several indexes have emerged in recent years to aid investors in tracking the area.

| | S&P Global Infrastructure Index | FTSE Macquarie Global Infrastructure 100 Index |
|---|---|---|
| Number of Companies | 75 | 100 |
| Number of Countries | 22 | 28 |
| % in United States | 24.2% | 39.5% |
| Sector Breakdown | 40.1% Utilities<br>20.7% Energy<br>39.2% Transportation | 89.6% Utilities<br>5.5% Energy<br>3.3% Industrials<br>1.6% Telecommunications |

| Recent Return and Risk Versus Global Equities (as of 12/31/07) | | | | |
|---|---|---|---|---|
| | 3Yr Return | 5Yr Return | 3Yr St. Deviation | 5Yr St. Deviation |
| S&P Global Infrastructure | 25.5% | 29.3% | 9.1% | 9.7% |
| Macquarie Global Infr. 100 | 24.2% | 26.6% | 8.6% | 9.7% |
| MSCI World | 13.3% | 17.5% | 7.1% | 11.3% |

*Source: UBS, Standard & Poors, FTSE, Ibbotson*

# Implementation Considerations

- Infrastructure does not fit classic mean-variance optimization modeling for determining appropriate asset allocation
  - No available market benchmark for historical risk, return and correlations
  - Private valuations and insufficient reporting of income provide little insight into reasonable return expectations
  - Risk and returns will vary significantly based on the maturity of the asset
- Return calculations may be "lumpy"
  - Possibility for J-curve at inception
  - Depending upon program, asset may be carried at book value until event triggers re-valuation
- Lack of transparency and market benchmarks will make this a difficult investment to monitor

# Commodities: Components

- On a production-weighted basis, energy comprises the largest component of the commodities market
- Some index providers, such as Dow Jones, cap sector weights to reduce the impact of the energy sector on index results.

## Composition of Commodity Indices

| Index | Energy | Industrial Metals | Precious Metals | Agriculture | Livestock |
|---|---|---|---|---|---|
| S&P Goldman Sachs Commodity Index | 71.8% | 7.8% | 2.4% | 14.4% | 3.6% |
| Dow Jones AIG Commodity Index | 33.0% | 20.0% | 10.1% | 29.5% | 7.4% |
| ***Sector Components:*** | *Crude Oil* | *Aluminum* | *Gold* | *Wheat* | *Live Cattle* |
| | *Brent Crude Oil* | *Copper* | *Silver* | *Red Wheat* | *Feeder Cattle* |
| | *RBOB Gas* | *Lead* | | *Corn* | *Lean Hogs* |
| | *Heating Oil* | *Nickel* | | *Soybeans* | |
| | *Gas-Oil* | *Zinc* | | *Cotton* | |
| | *Natural Gas* | | | *Sugar* | |
| | | | | *Coffee* | |

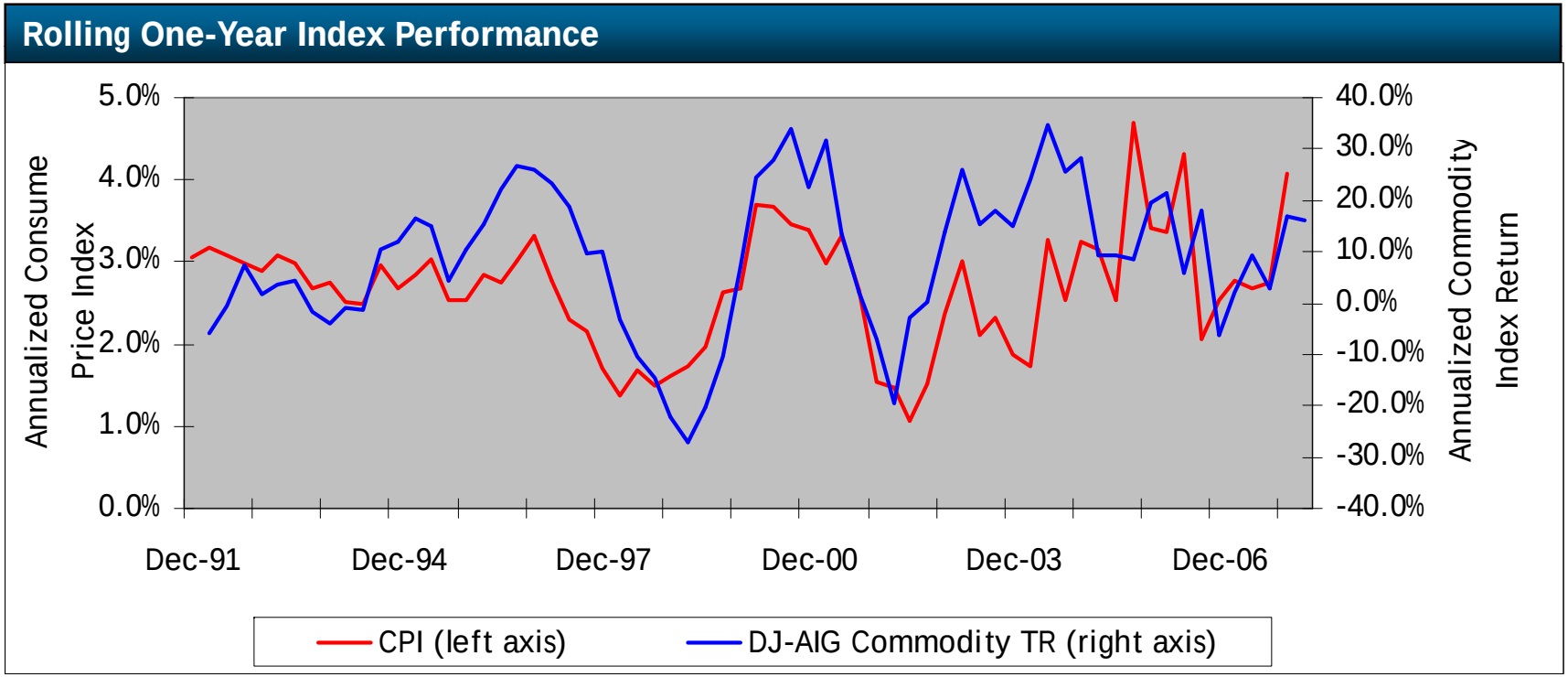
The S&P GSCI Total Return Index is a world-production weighted index. The weightings also reflect the liquidity of the underlying futures contracts.

The Dow Jones-AIG Commodity Total Return Index is both liquidity (2/3) and production (1/3) weighted, with constraints on individual commodities (15%) and commodity groups (33%). This index is rebalanced annually in January, so percentage weights will fluctuate throughout the year.

*Source: Dow Jones, Goldman Sachs*

# Commodities & Inflation

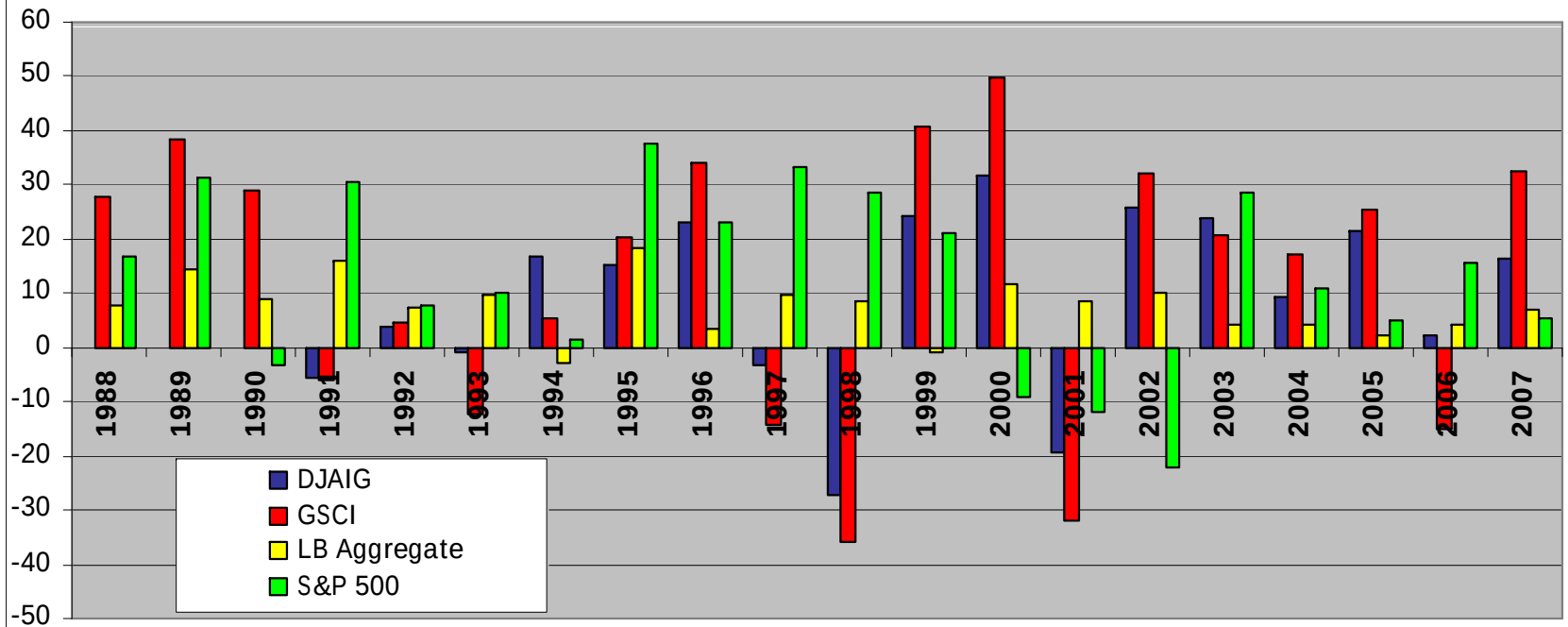
- Although not perfect, commodities prices tend to surge in advance of increases in the Consumer Price Index.
- The chart below depicts this relationship, albeit at drastically different scales.



# Commodities: Diversification & Returns

Commodities have seen equity-like volatility during the last two decades. While they provided much needed diversification in 2002 when equity markets were down, commodities had several years with significant negative returns including 2001.

**Annual Returns: Last Twenty Years**

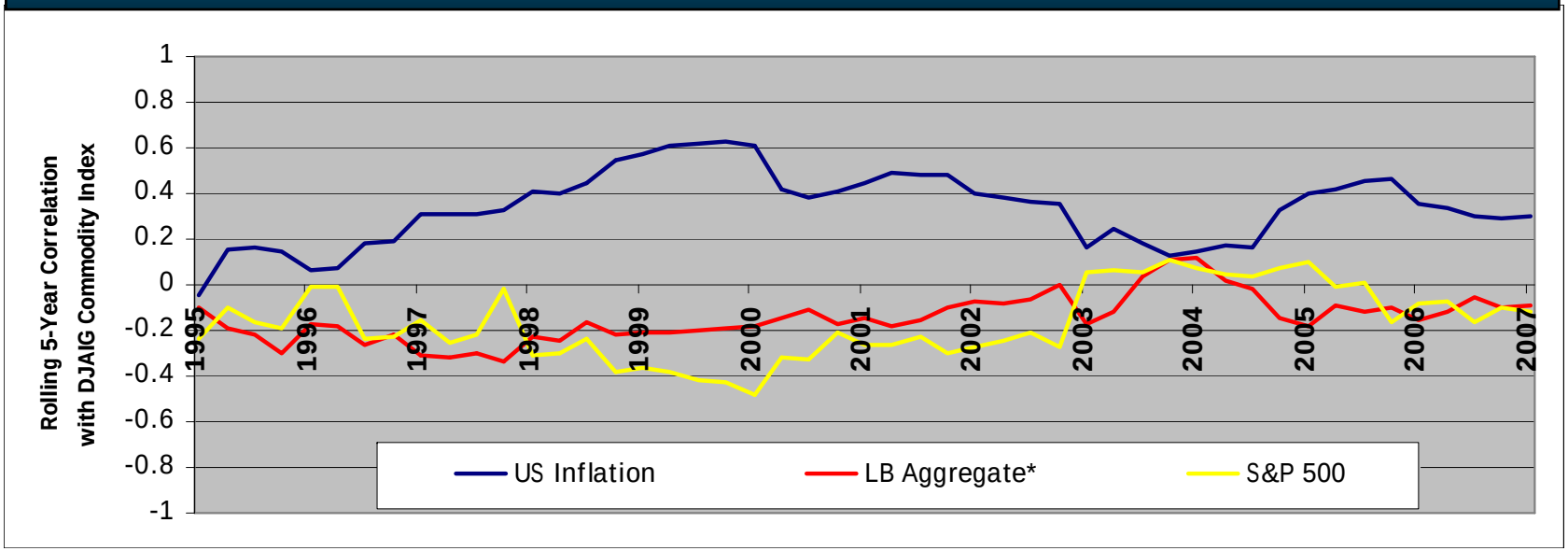


# Commodities: Diversification

Since the inception of the DJ AIG Commodity Index (1991), commodities have had very low correlations with traditional asset classes and positive correlation to inflation:

- -0.20 correlation to Equities
- -0.15 correlation to Bonds
- +0.33 correlation to Inflation

## Correlation with Commodities (DJAIG)




Source: Ibbotson. Correlation based on quarterly observations from July 1982 through December 2006.

# How to Invest in Commodities

Two primary options:

- **Purchase the physical commodity** – the purest exposure to the commodity, but delivery, storage and spoilage may be problematic.
- **Invest through the futures market** – synthetic exposure using derivatives or total return swaps engineered by financial intermediaries.
  - Most institutional investors access the asset class this way
  - Available through commingled or mutual funds
  - Very large institutional investors may consider a separate account

# Investing in Commodities Using Futures

There are three primary sources of return when investing in commodities futures:

- **Commodity price increases** – the gradual (or rapid, in the case of oil lately) appreciation in the prices of various commodities.
- **Future roll returns** – futures contracts expire regularly and the investment manager must "roll" into the new contract to maintain consistent exposure. From time to time certain contracts will be "cheap" and the manager can exploit that and add incremental return.
- **"Income"** – returns on the cash collateral underlying the futures position cover the implied financing rate of the futures contract (the risk-free rate). If managed well, this component can provide enhanced income, adding to overall returns.

# Implementation Considerations

## Commodities

- Recent strong performance and higher volatility expectations may lead to near-term mean-reversion
- Futures markets have moved into extreme "contango" (see p3 for explanation)
- In evaluating & selecting commodities managers, points to consider in light of the current environment:
  - An actively managed futures exposure may mitigate some of the issues associated with contango
    - How is manager rolling futures contracts (see p4 for explanation) – via a set short-term standard mechanism or actively selecting different contract maturities?
  - An actively managed and diversified exposure commodities, possibly including commodity-related equities, may mitigate some of the concern with recent performance
    - Does manager follow an index for commodity exposure or actively manage commodity allocations? If the latter, what are the manager's guidelines?
    - If manager utilizes equity securities, how do they think about the relationship between the futures and the equities? What impact is there on volatility?
- Wurts & Associates believes Commodities are excellent long-term diversifiers for endowments and foundations. However, a careful strategy at inception would be prudent. Moving forward with manager due diligence and using a multi-step investment plan (dollar-cost averaging) is recommended.

# Factors Affecting Commodity Futures

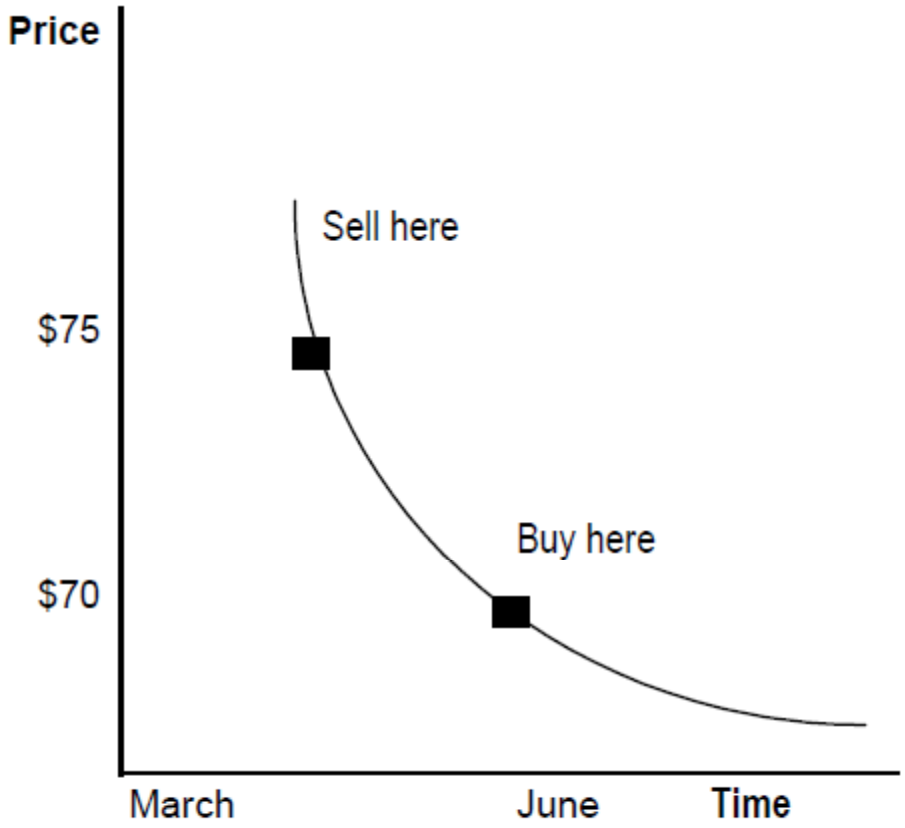
- **Contango**
  - Indicated by an upward sloping futures curve; the price of a commodity for future delivery is *higher* than the spot price, or a far future delivery price higher than a nearer future delivery.
  - A contango is normal for a non-perishable commodity which has a cost of carry. Such costs include warehousing fees and interest forgone on money tied up, less income from leasing out the commodity if possible (*e.g.* gold). However, markets for non-perishable goods may also exist in a state of contango.
  - The contango should not exceed the cost of carry, because producers and consumers can compare the futures contract price against the spot price plus storage, and choose the better one. Arbitrageurs can sell one and buy the other for a risk-free profit too
  - May indicate perception of current supply surplus in the commodity.

- **Backwardation**
  - Opposite of Contango
  - Indicated by a downward sloping futures curve; the price of a commodity for future delivery is *lower* than the spot price, or a far future delivery price lower than a nearer future delivery
  - Near prices become higher than far prices because consumers prefer to have the product sooner rather than later, and because there are few holders who can make an arbitrage profit by selling the spot and buying back the future.
  - May indicate a perception of a current shortage in the underlying commodity.

# Contango & Backwardation

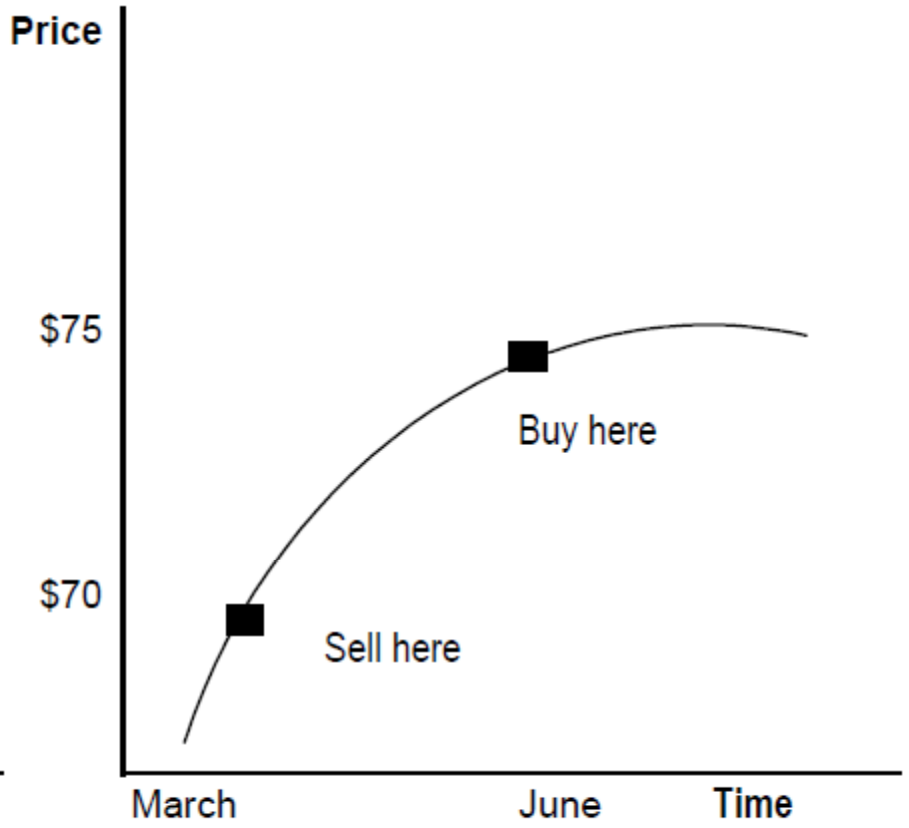
**Backwardation**:

*When the futures curve is in backwardation, the "roll" results in a profit*




**Contango**:

*When the futures curve is in contango, the "roll" results in a loss*



# Disadvantages of Investing in Commodities

- Cash-like or bond-like long-term expected returns, despite equity-like volatility
  - Real prices may not rise (e.g. real price of corn today is the same as it was 100 years ago).
  - Productivity improvements have brought down cost of producing some commodities, and consequently a stable to falling trend in real commodities has emerged.
- Commodities indices have posted significant draw-downs in the past decade.
- Commodities won't perform well headed into economic slowdowns
- "Tracking error" from management of collateral portfolios can detract from returns

# Opportunistic Fixed Income Management – Risks

- Additional risk factors of Opportunistic Bond strategies include:
  - Concentration risk leads to higher volatility
  - Increased liquidity risk
  - Shorter track records makes it difficult to evaluate strategies
  - Very difficult to model using standard mean-variance optimization methods

# Opportunistic Fixed Income – Implementation

- Total Allocation - Due to higher volatility, Opportunistic Bond strategies should make up no more than 33% of total fixed income allocation.
- Benchmark Selection – Strategies are often benchmarked by both standard market benchmarks (Lehman Aggregate, Lehman Universal, Citigroup World Gov't Bond) and absolute return benchmarks (LIBOR + 2.5%, CPI + 5%). This should be reviewed on a case-by-case basis.
- The expected return used was 6.50%.

# Actuarial Assumptions Used

**Valuation date:** June 30, 2007

**Actuarial cost method:** Entry Age Normal Cost Method

**Amortization method:** Level percent of payroll for total unfunded liability

**Remaining amortization period:** 26 years (declining) for UAAL established as of June 30, 2003 plus 15 years (declining) for UAAL and change in actuarial assumption established on each subsequent valuation. The increase in UAAL due to benefit improvements is amortized over 30 years.

**Asset valuation method:** The Actuarial Value of Assets is determined by phasing in any difference between the actual and the expected market return over 10 six-month interest crediting periods. The Valuation Value of Assets is the Actuarial Value of Assets reduced by the value of the non-valuation reserves.

**Actuarial assumptions:**

Investment rate of return 8.00%

Inflation rate 3.75%

Real across-the-board salary increase 0.25%

Projected salary increases* General: 4.90% to 10.00% and Safety: 5.25% to 10.00%

Cost of living adjustments 3.00% of retirement income

**Plan membership:**

Retired members and beneficiaries receiving benefits = 4,831

Terminated members entitled to, but not yet receiving benefits = 1,393

Active members = 7,802

Total = 14,026

All assumptions made in regard to the liabilities were taken from the Segal Group Inc. valuation report as of June 30, 2007. Additional Information on actuarial assumptions listed in Appendix for reference.

# Additional Actuarial Assumptions

**Employer contributions consist of two components:**

***Normal Cost*** The annual contribution rate that, if paid annually from a member's first year of membership through the year of retirement, would accumulate to the amount necessary to fully fund the member's retirement-related benefits. Accumulation includes annual crediting of interest at the assumed investment earning rate.

***Contribution to the Unfunded Actuarial Accrued Liability (UAAL)*** The annual contribution rate that, if paid annually over the UAAL amortization period, would accumulate to the amount necessary to fully fund the UAAL. Accumulation includes annual crediting of interest at the assumed investment earning rate. The contribution (or rate credit in the case of a negative UAAL) is calculated to remain as a level percentage of future active member payroll (including payroll for new members as they enter the Association) assuming a constant number of active members. In order to remain as a level percentage of payroll, amortization payments (credits) are scheduled to increase at the annual inflation rate of 4.00% (i.e., 3.75% inflation plus 0.25% real across-the-board salary increase). The UAAL established as of the June 30, 2003 valuation is being amortized over a declining 26-year period. Any new UAAL established on each subsequent valuation after June 30, 2003 as a result of actuarial gains or losses and changes in actuarial assumptions has been amortized over a separate 15-year declining period. The increase in UAAL due to benefit improvements (such as moving some members from General Tier 2 to Tier 3) is amortized over 30 years.

**Member Contributions:**

Articles 6 and 6.8 of the 1937 Act define the methodology to be used in the calculation of member basic contribution rates for General members and Safety members, respectively.

The basic contribution rate for the Regular benefit is determined so that the accumulation of a member's basic contributions made in a given year until a certain age will be sufficient to fund an annuity at that age that is equal to 1/240 of One-Year Average Final Compensation for General Tiers 1 and 2, 1/200 of Three-Year Average Final Compensation for General Tier 3 and 1/200 of One-Year Average Final Compensation for Safety Tiers 1 and 2. That age is 55 for all General Tiers 1 and 3, 60 for all General Tier 2 and 50 for Safety Tiers 1 and 2. In addition, as a result of the Settlement Agreement, General Tier 1 and Safety Tier 1 members are required to make additional basic contributions in order to receive the Settlement Benefit. The total basic Regular plus Settlement rate is 1/160 of One-Year Average Final Compensation at retirement age 55 for General Tier 1 and 1/160 of One-Year Average Final Compensation at retirement age 50 for Safety Tier 1. It is assumed that contributions are made annually at the same rate, starting at entry age. In addition to their basic contributions, members pay one-half of the total normal cost necessary to fund their cost-of-living benefits. Accumulation includes semiannual crediting of interest at the assumed investment earning rate.

# Glossary

**General Terms**

**Active Management:** A method of portfolio management that is based on the assumption that security prices do not always reflect their true value and that this discrepancy will eventually be corrected over time, Managers engaging in active management are trying to find securities that they feel are currently priced below their true value. As the rest of the market realizes that the security is selling for less than it is really worth, the forces of supply and demand will drive the price up and the manager will make money.

**Asset Allocation:** The choice of which asset classes to invest in and in what proportion. It has been shown that greater than 90% of the return on a portfolio is due to asset allocation.

**Index:** A passively manager portfolio of securities that remains constant from one period to the next. Indexed are used to gauge the performance of sectors of the market or the market as a whole. In addition, indexes are used as a benchmark for measuring the performance of investment managers.

**Information Ratio:** Information ratio is a measure of value added by the manager. It is the ratio of (annualized) excess return above the benchmark to (annualized) tracking error. (IR= Excess Return / Tracking Error)

**Passive Management:** A method of portfolio management that is based on the belief that all securities are fairly priced and that there are no additional returns to be made from security selection. Often called a buy and hold strategy or indexing, this method calls from purchasing a well diversified portfolio of securities and holding on to them indefinitely.

**Policy Index:** A performance benchmark for the total fund that is customized for each plan. The policy index represents the return that would have been produced by passively investment in the target asset allocation of the plan.

**Portfolio Turnover:** The percentage of a portfolio that is sold and replaced (turned over) during a given time period. Low portfolio turnover is indicative of a buy and hold strategy while high portfolio turnover is symptomatic of a more active, trading form of management.

**Risk-Free Rate:** The rate of interest that one can earn on an investment with no default risk. It is generally assumed to be the interest rate on a 91 day T-Bill.

**Sharpe Ratio:** A risk-adjusted return that is calculated by taking the excess return of a portfolio above the risk-free rate and dividing that by the standard deviation of the portfolio. The Sharpe Ratio gives you the amount of return you receive for each unit of risk, standard deviation, that you take on.

**Standard Deviation:** A measure of total risk, systematic and unsystematic, of a security or portfolio. Standard deviation is the square root of variance and is a measure of volatility about the mean of a distribution.

**Total Fund:** Computed by aggregating the returns from each of the individual investment managers of a plan. It is the total return of the plan's investments taken as a whole.

**Tracking Error:** A measure of how closely a manager's returns track the returns of a benchmark. The tracking error is the annualized standard deviation of the differences between the manager's and the benchmark's quarterly returns. If a manager tracks a benchmark closely, then tracking error will be low. If a manager tracks a benchmark perfectly, then tracking error will be zero.

**Universe:** Also called a peer group, a universe is a large number of portfolios of a similar style. These portfolios can be divided into deciles or quartiles and then used for performance measurement and comparative purposes. Portfolios are given a rank within the universe that tells you how well the manager of that portfolio has done relative to their peers.