

**The Public School Retirement System of
The School District of Kansas City, Missouri**

Asset / Liability Analytics 12/31/2016

March 2017

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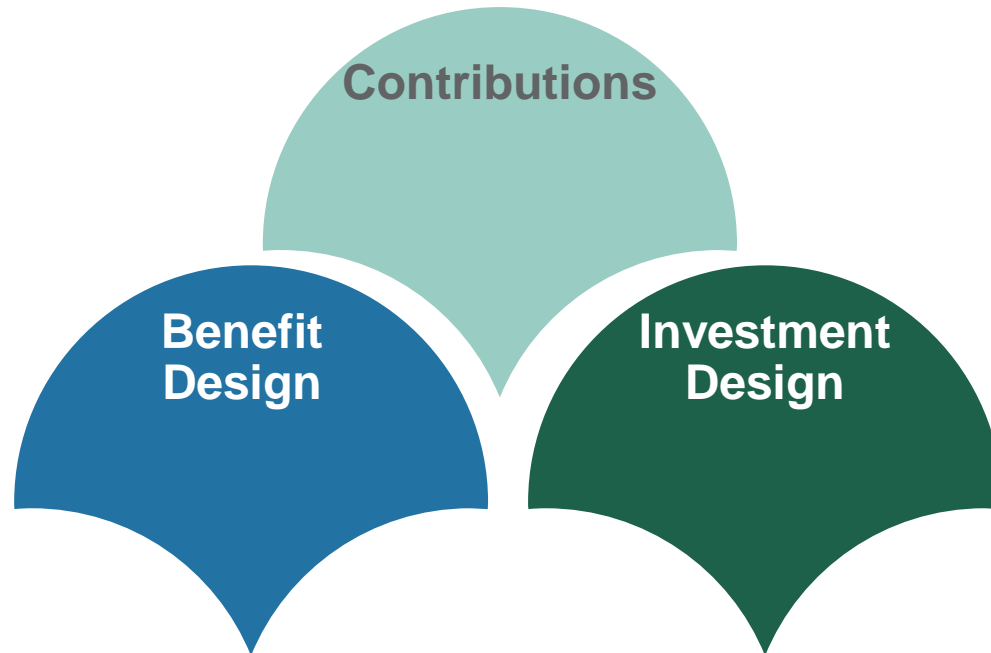
Background—Estimate of the Current Status

- The system returned 7.92% in calendar year 2016 which was slightly below the actuarial assumption rate of 8.0% at the beginning of 2016
- The actuarial liabilities reflect the changes approved from the 2016 experience study
 - This includes a new actuarial assumption rate of 7.75%, down from 8.0%
- The system is underfunded today with a funded ratio of 64% and a (deficit) of (\$349M)
 - We are using market value of assets in determining these metrics
- Total Contributions of \$33M are anticipated in the upcoming year which corresponds to 18% of payroll
- Benefit payments of \$85M are anticipated

| | 12/31/16 (Millions) | Discount Rate |
|---|------------------------|------------------|
| 1. Market Value Assets | \$618 | |
| 2. <u>Cash, Receivables, etc.</u> | <u>\$13</u> | |
| 3. Total Market Value Assets | \$631 | |
| 4. System's Rate of Return for Calendar Year 2016 | 7.92% | |
| 5. Actuarial Liability | \$981 | 7.75% |
| 6. Funded Ratio <i>(Total Market Value Assets/Actuarial Liability)</i> | 64% | |
| 7. (Deficit) Surplus <i>(Total Market Value Assets less Actuarial Liability)</i> | (\$349) | |
| 8. Contributions Plan Year 2017 | \$33 | |
| 9. Benefit Payments Plan Year 2017 | \$85 | |

Levers of Pension Funding

- As noted in the March presentation, long-term pension fund success is based on all three levers working together
- **We will focus on investment structure but that alone will not be enough to counter the impact of the new assumptions reflected in the experience study on the long-term sustainability of the system. These assumptions represent the current best thinking from your actuary with regards to the reality of the system's current and future status.**

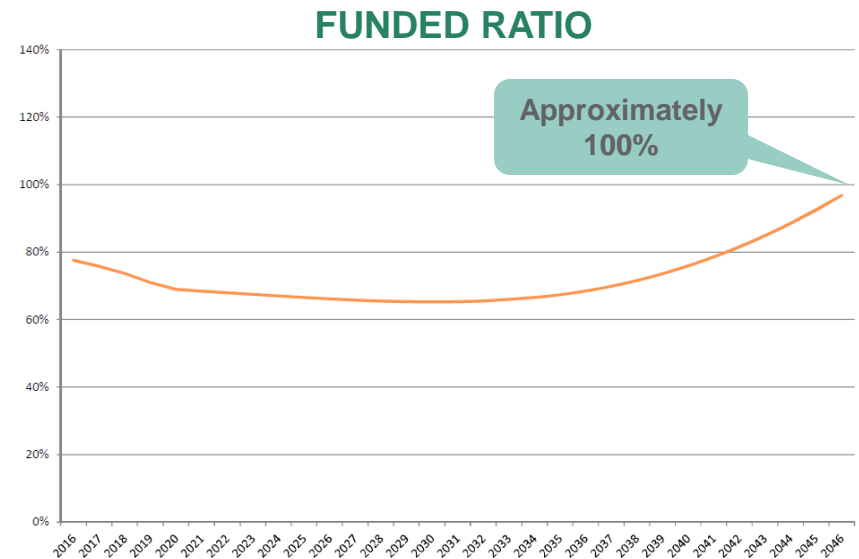


Experience Study 2016- 30 Year Projections

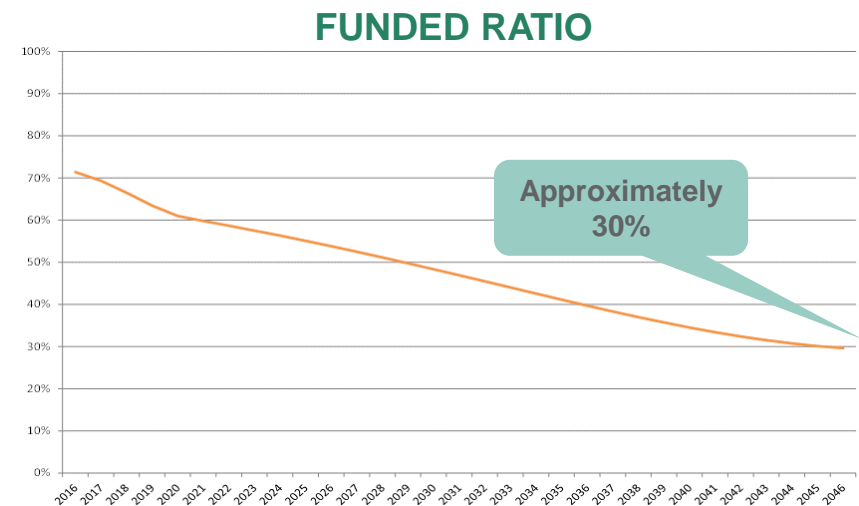
| | 01/01/2016 |
|---|--------------|
| Actuarial Liability Before Experience Study | \$895 |
| Actuarial Liability After <u>Experience Study</u> | <u>\$973</u> |
| Increase in AAL | \$78 |
| Market Value Funded Ratio (Market Value Assets/Actuarial Liability) Before Experience Study | 71% (78%)* |
| Market Value Funded Ratio After Experience Study | 65% (71%)* |

Source: March 2017 joint presentation

- As noted in the March presentation, the results of the recent experience study in 2016 and its impact on the liability have been dramatic.
- Many plans have contribution policies which automatically respond and increase the contributions as actuarial liabilities increase due to the actual experiences and updated actuarial valuations



Source: 2016 Actuarial Valuation Report



Source: March 2017 Presentation

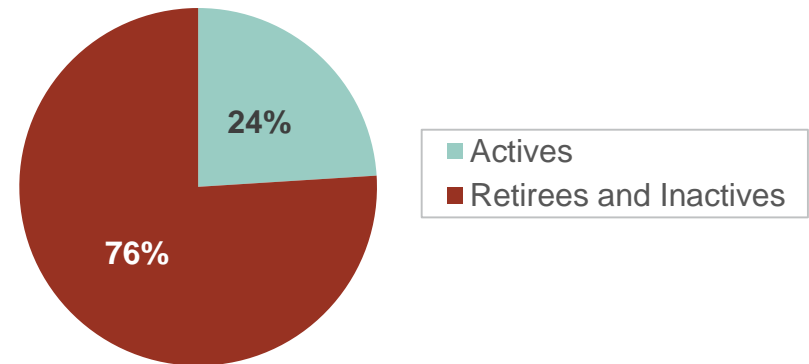
KCPSRS Contribution History

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|--|-------|--------|--------|---------|---------|---------|---------|
| Total Contribution Rate* | 15.0% | 15.0% | 15.0% | 15.0% | 16.0% | 17.0% | 18.0% |
| Actuarial Required Contribution (ARC) | 11.5% | 14.64% | 18.3% | 20.52% | 19.68% | 19.56% | 20.18% |
| Contribution Excess (Shortfall) | 3.5% | 0.36% | (3.3%) | (5.52%) | (3.68%) | (2.56%) | (2.18%) |

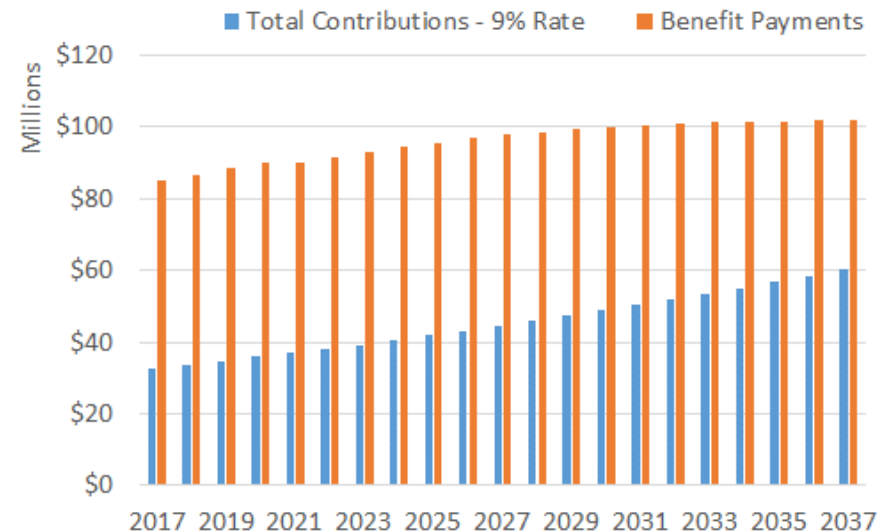
Plan Liability Metrics

- The system's demographics are mature as 76% of the actuarial liability is associated with retirees and inactives
- During our prior ALM study, we noted the maturity of the system with 73% of the actuarial liability associated with retirees and inactives. This number continues to climb
- Another manifestation of a mature system is that the contributions coming into the system may be significantly less than the benefit payments coming out

ESTIMATED ACTUARIAL LIABILITY AT 1/1/2017 \$981M



CASHFLOWS



Liquidity Risk

- The plan is anticipated to payout \$52M more in benefit payments than contributions coming into the trust
- This represents 8% of the market value of the plan
- This shortfall must be made up by investment income (dividends, bond coupons, real estate distributions, etc.) and selling investments
- Some investments owned by the plan cannot be easily and quickly sold
 - Private equity is an example of investments which cannot be easily sold

| | Calendar Year 2017 Estimates |
|---|---------------------------------|
| 1. Market Value Assets (1/1/2017) | \$631 |
| 2. Contributions | \$33 |
| 3. <u>Benefit Payments</u> | <u>\$85</u> |
| 4. Cashflow Shortfall | (\$52) |
| 5. Cashflow Shortfall/ Market Value Assets | -8% |

More Liquid



Cash
 Public Equities
 Government Bonds
 Commodities—exchange traded
 Investment Grade Corporate Bonds
 High Yield Bonds
 Hedge Funds
 Real Estate
 Private Equity

Less Liquid

➤ Scenario Projections

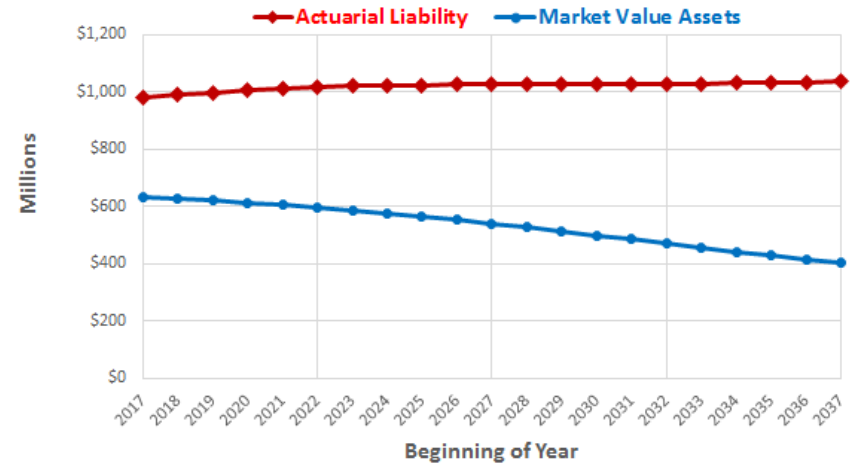
Projection Assumptions—Actuarial Baseline

| | Actuarial Baseline |
|---|---|
| 1. Market Value Assets' Rate of Return | 7.75% |
| 2. Actuarial Liability | Reflect experience study approved changes with no significant (gains) or losses anticipated |
| 3. Workforce Level | Level |
| 4. Payroll Growth | 3 – 3.5% |
| 5. Contribution Rate (Employee plus Employer) | 18.0% |
| 6. Cost of Living Adjustments | None |
| 7. Administrative Expenses | Not reflected in the analysis |

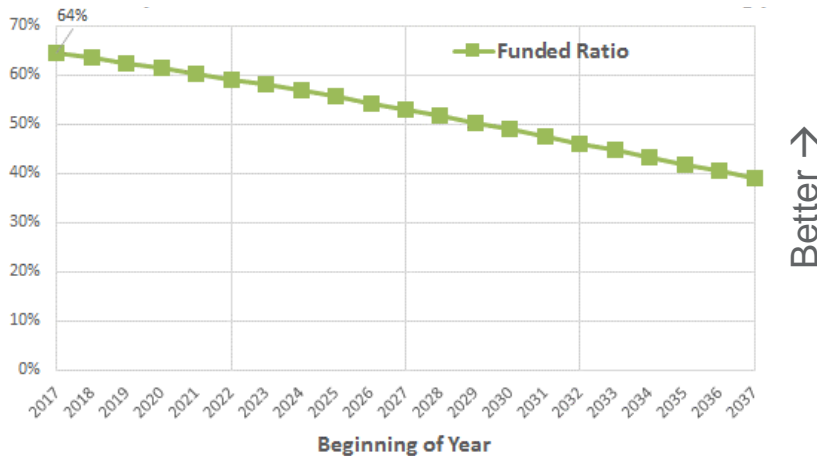
Projection—Actuarial Baseline (20 year Horizon)

- Assets' rate of return is assumed to match the actuarial assumption rate of 7.75%
- Liabilities are **growing** modestly as benefit payments offset normal cost and interest cost
- Assets are **declining** as contributions plus investment returns is less than benefit payments
- Funded ratio declines across time
- The system's (deficit) worsens across time

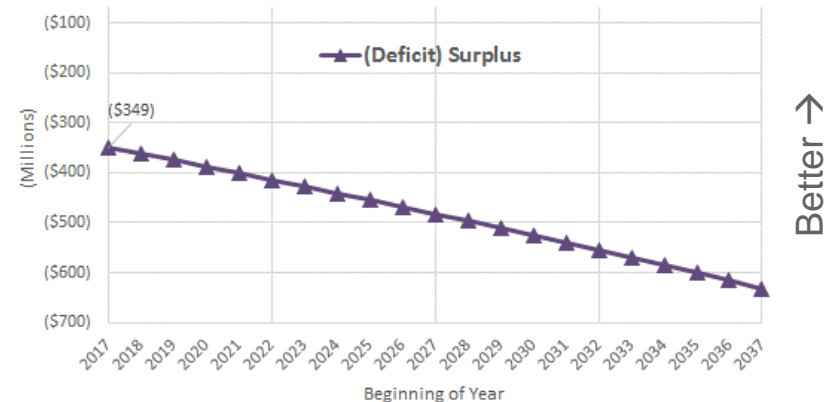
ASSETS AND LIABILITIES



FUNDED RATIO (Market Value Assets / Actuarial Liability)



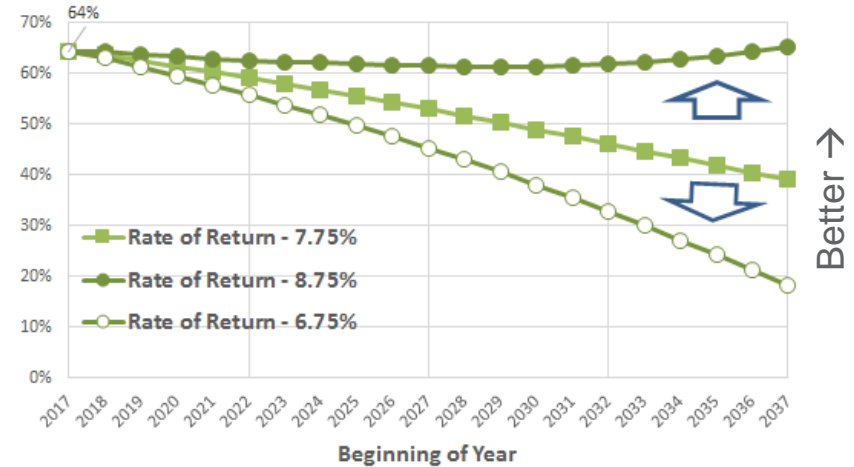
(DEFICIT) SURPLUS (Market Value Assets Less Actuarial Liability)



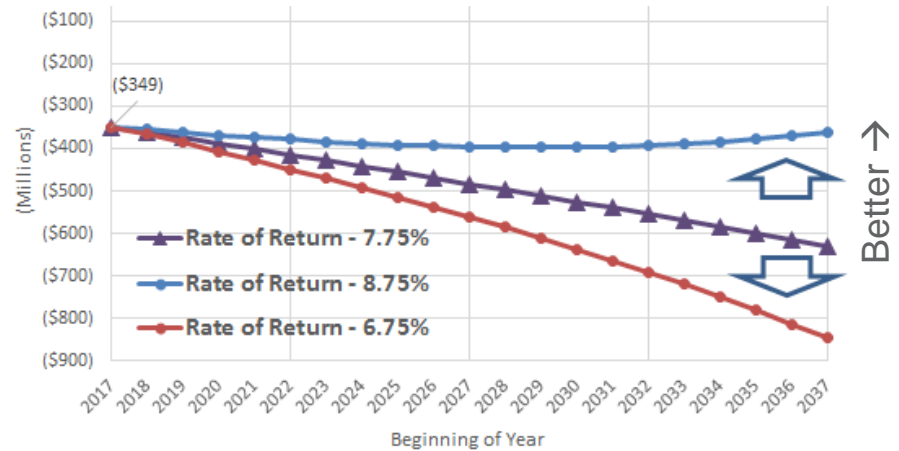
Projection—Rate of Return Sensitivity (20 year Horizon)

- We found the sensitivity of the previous projection to a +/- 1.0% rate of return
 - 7.75%, 8.75% and 6.75%
- If the system's investments earn 8.75% per annum (1.0% higher than the actuarial assumption), the plan's funded status remains relatively stable over the next twenty years
- If the rate of return is 1.0% per annum less than the actuarial assumption or 6.75% per annum, the decline is worse particularly in the out years

FUNDED RATIO
(Market Value Assets / Actuarial Liability)



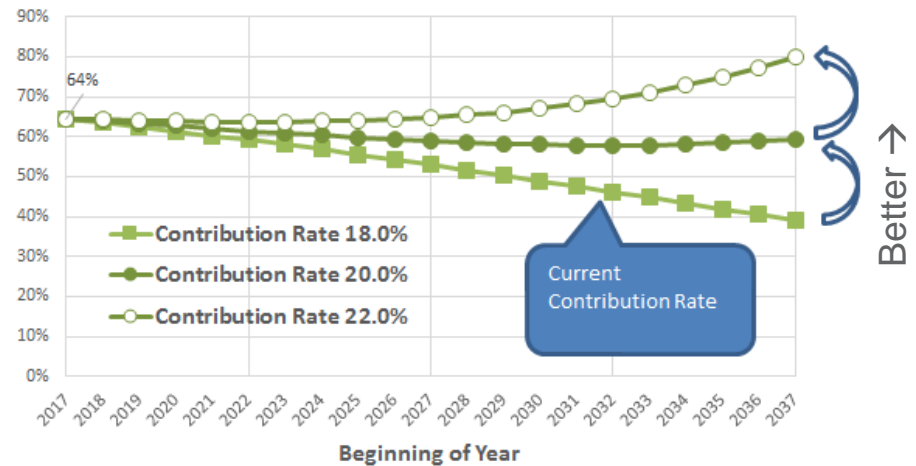
(DEFICIT) SURPLUS
(Market Value Assets Less Actuarial Liability)



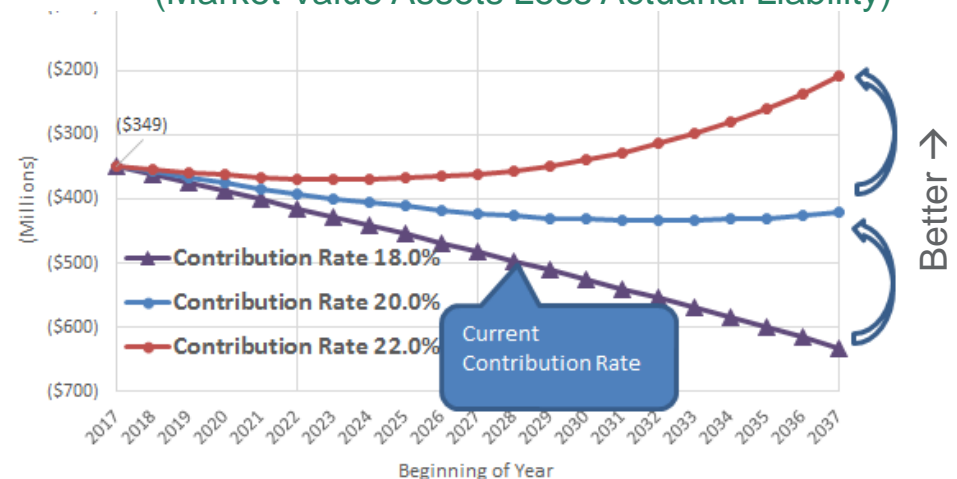
Projection—Contribution Sensitivity (20 year Horizon)

- All scenarios assume the plan returns 7.75% per annum
- These charts show the sensitivity of increased contribution rates
- As contributions increase the funded ratio and deficit improves. This does not factor in the possibility of a lower or higher compound rate of return
- Increasing the contribution rate from 18% to 22% allows the funded ratio to start to increase again and achieve a 80% level after 20 years
- Increased contributions result in a healthier overall Plan

FUNDED RATIO
(Market Value Assets / Actuarial Liability)



(DEFICIT) SURPLUS
(Market Value Assets Less Actuarial Liability)



Funded Ratio Scenario Matrix

- The tables represent a simplistic combination of returns and contribution rates
- Earning 7.75% (the actuarial assumption rate) and contributing the current 18% of payroll, the plans funded ratio is:
 - At 2027 – 53%
 - At 2037 – 39%

| | Funded Ratio at Horizon 2027 TOTAL CONTRIBUTION RATE | | |
|--------------------------------|---|-------|-------|
| Annual Compound Rate of Return | 18.0% | 22.0% | 26.0% |
| 8.75% | 61% | 74% | 86% |
| 7.75% | 53% | 65% | 77% |
| 6.75% | 45% | 57% | 68% |
| 5.75% | 38% | 49% | 60% |
| 4.75% | 32% | 42% | 52% |

| | Funded Ratio at Horizon 2037 TOTAL CONTRIBUTION RATE | | |
|--------------------------------|---|-------|-------|
| Annual Compound Rate of Return | 18.0% | 22.0% | 26.0% |
| 8.75% | 65% | 110% | 156% |
| 7.75% | 39% | 80% | 120% |
| 6.75% | 18% | 55% | 92% |
| 5.75% | 2% | 35% | 68% |
| 4.75% | 0% | 19% | 49% |

➤ Capital Market Assumptions

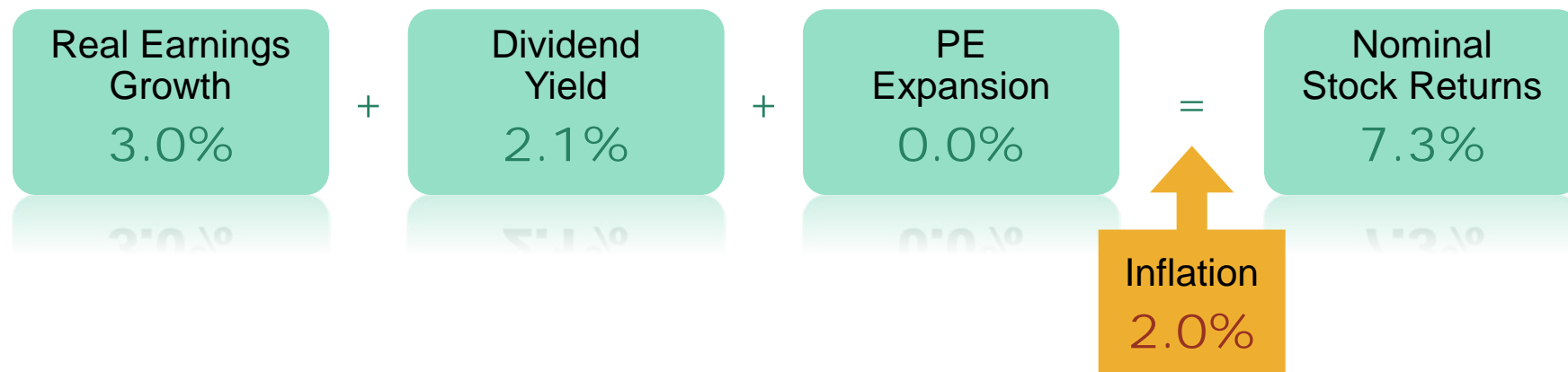
Capital Market Outlook

Key Themes

- Focus on forward-looking returns
- Build assumptions on key fundamentals: yields, spreads, PE ratios, etc.
- Assumptions here are passive and gross returns
- Key observations:
 - Almost uniformly asset classes are more expensively priced today than history and therefore forward-looking returns are lower
 - Fundamentals and valuations today will create a significant headwind in the short to intermediate term as we anticipate normalization as the most likely outcome
 - Areas we are constructive on:
 - Credit
 - Emerging market debt
 - Emerging market equity
 - Illiquid assets
 - Alternative solutions such as Multi-Asset class strategies (GTAA)
 - Areas we are not constructive on:
 - Non-USD Sovereign debt
 - Broad Barclays Aggregate Index
 - Hedge Fund of funds (as opposed to direct)

Broad U.S. Equity—Nominal Returns (20 Year Horizon)

- Key Building Blocks of Expected Equity Returns
- The return decomposition approach suggests a **7.3%** compound nominal return assumption for U.S. Equity consistent with the following:
 - 3.0% real earnings growth
 - 2.1% dividend yield
 - No assumed P/E expansion or contraction
 - 2.0% inflation (our long-term assumption)
- $(1.030)(1.021)(1.000)(1.020) = 1.073$

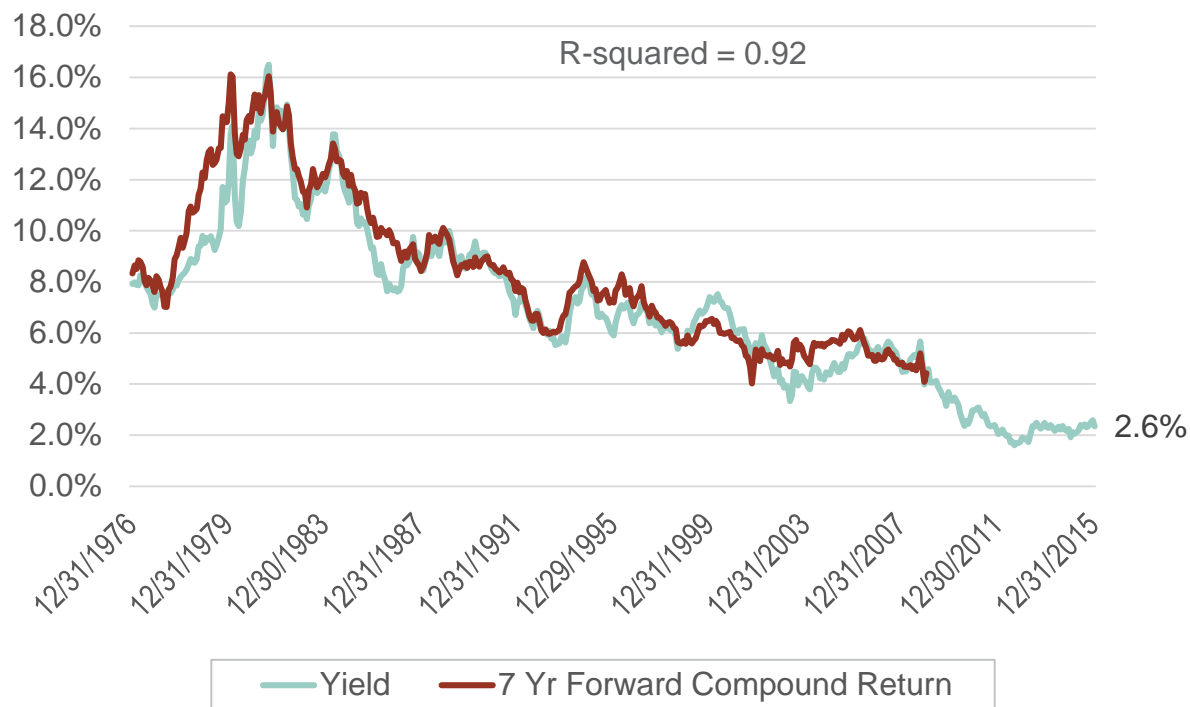


Disclaimer

All numbers represent Segal Marco Advisors' forward looking asset class assumptions, and as such, reflect estimates as of a certain date. These assumptions are not a guarantee of future performance, do reflect high levels of uncertainty and are subject to change without notice.

Core Fixed Income Historical Returns

BARCLAYS US AGGREGATE BOND INDEX



Last Complete Seven Year Cycle:
12/31/2008 – 12/31/2015

Yield 4.0% (12/31/2008)
7 Year Forward Return 4.1%

As of 12/31/2015 Barclays US
Aggregate Yield is **2.6%**

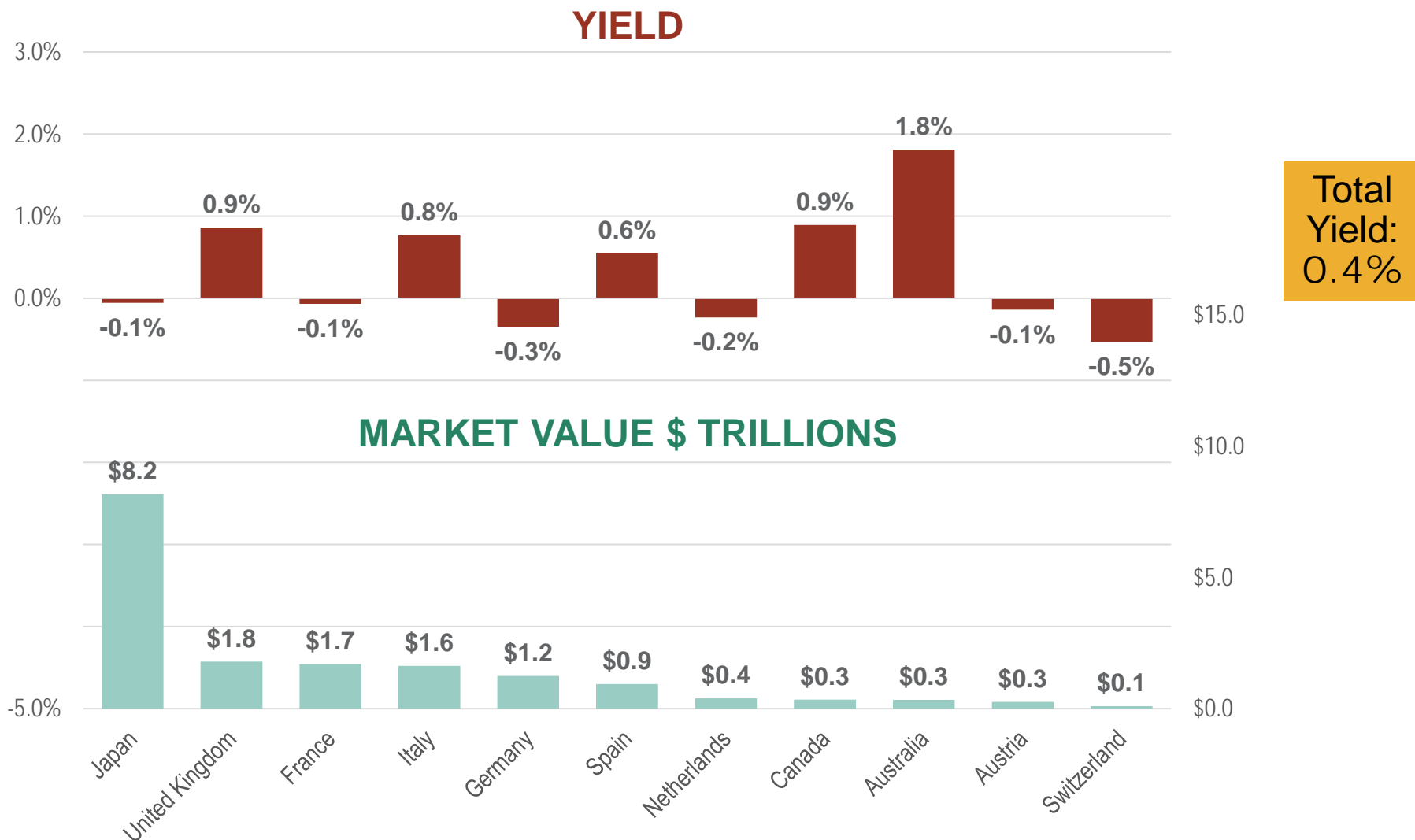
We are 67% confident that the
**7 Year Forward Compound
Return** will be between
1.7% and 3.5%

**Our 10 year compound return
is 2.8%**

- For investment grade bonds, current yield is a strong predictor of future return
- R-squared between current yield and 7-year forward compound rate of return is 0.92
- Note yields today are 2.6% ~ 7-year forward compound rate of return

Non-US Developed Fixed Income

➤ Rest of the world's sovereign debt isn't any better

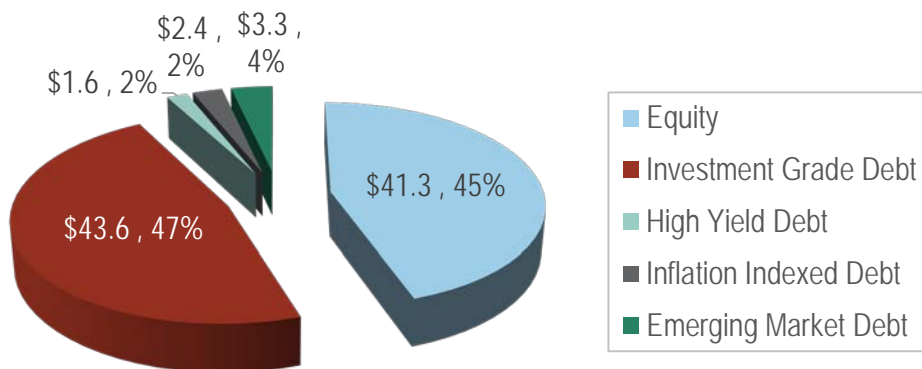


Capital Market Assumption Development

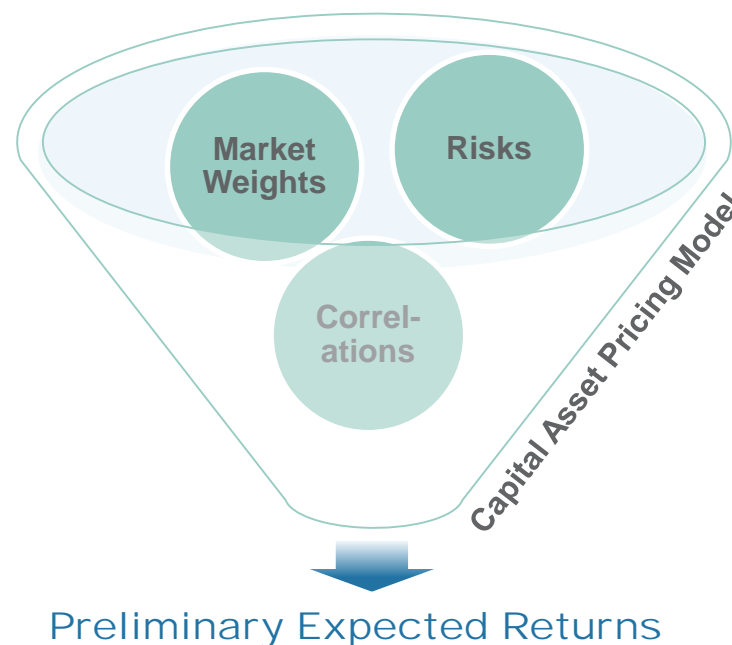
- We combine various measures of valuation to determine our long-term capital market assumptions
- Top-down approaches use reverse optimization(1) and the Capital Asset Pricing Model (CAPM) developed by William Sharpe (similar to the Black-Litterman model)
- Bottom-up approaches use building block models

ESTIMATED GLOBAL LIQUID INVESTIBLE MARKET PORTFOLIO

GLOBAL INVESTIBLE MARKET PORTFOLIO (Liquid) (T) \$92.2



REVERSE OPTIMIZATION



(1) Reverse optimization uses market weights, standard deviation and correlation as inputs and the output is expected returns; see William Sharpe in "Imputing Expected Security Returns from Portfolio Composition"

Capital Market Assumptions

EXPECTED RETURN

| | | 10 Year Return | 20 Year Return | Risk |
|--------------|--------------------------------|----------------|----------------|-------|
| Fixed Income | Core Fixed Income | 3.2% | 4.0% | 5.5% |
| | High Yield | 5.5% | 6.0% | 11.0% |
| | Emerging Markets Debt (50% LC) | 5.6% | 6.4% | 10.5% |
| | Global Fixed Income (U) | 2.3% | 3.1% | 7.9% |
| Equity | US Equity | 6.5% | 7.3% | 18.0% |
| | Developed Equity (U) | 6.9% | 7.7% | 21.0% |
| | Emerging Markets Equity | 8.3% | 9.1% | 25.0% |
| Alternatives | MACS (GTAA) | 5.9% | 6.7% | 9.0% |
| | Private Equity | 9.9% | 10.7% | 22.5% |
| | Hedge Fund of Funds | 4.9% | 5.7% | 5.8% |
| | Hedge Funds—Equity Long/Short | 6.0% | 6.8% | 10.0% |
| | Commodities | 4.0% | 4.8% | 20.0% |
| | Real Estate (UL) | 5.8% | 6.6% | 11.5% |

- Forward-looking assumptions
- Both equity and fixed income returns are lower than historical given valuation levels today

KCPSRS Target Allocation

Twenty Year Horizon

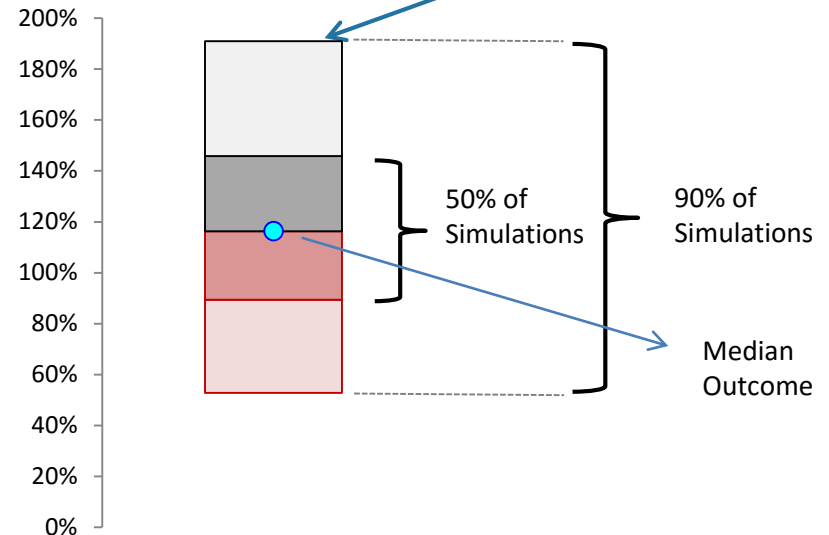
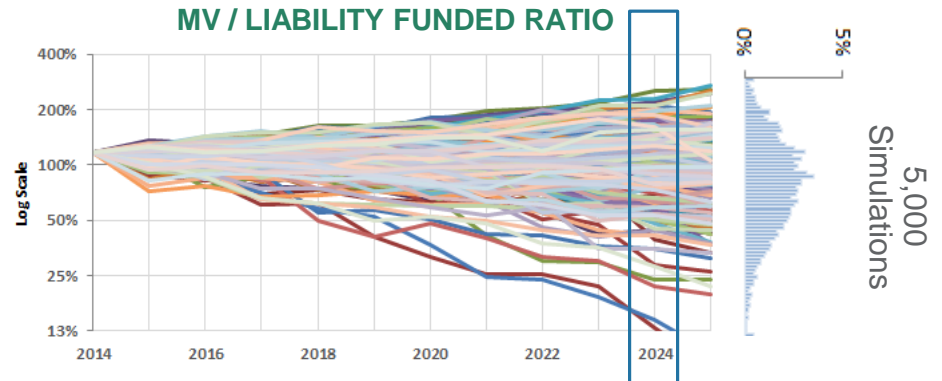
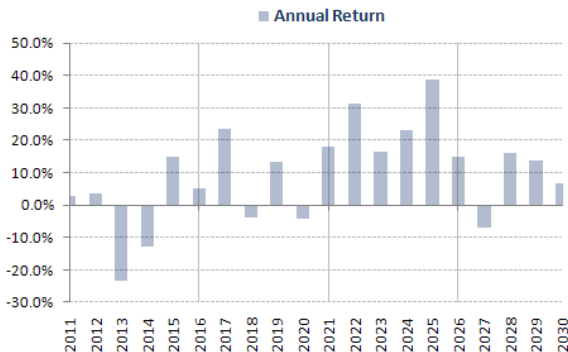
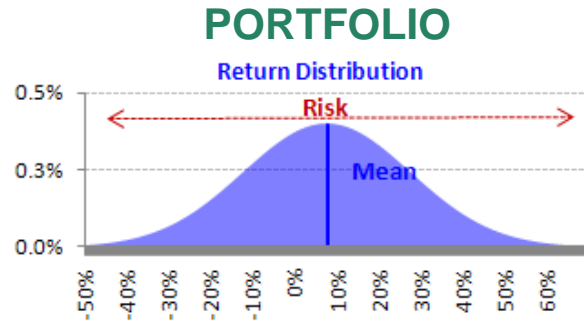
| | | Target |
|---------------|--------------------------------|---------------|
| Fixed Income | Core Fixed Income | 10.0% |
| | High Yield | 2.5% |
| | Emerging Markets Debt (50% LC) | |
| | Global Fixed Income (U) | 5.0% |
| Equity | US Equity | 22.5% |
| | Developed Equity (U) | 15.0% |
| | Emerging Markets Equity | 10.0% |
| Alternatives | MACS (GTAA) | 7.5% |
| | Private Equity | 5.0% |
| | Hedge Fund of Funds | 3.0% |
| | Hedge Funds—Equity Long/Short | 4.5% |
| | Commodities | 5.0% |
| | Real Estate (UL) | 10.0% |
| | Sum | 100.0% |
| | % Total Fixed Income | 17.5% |
| | % Total Equity | 47.5% |
| | % Total Alternatives | 35.0% |
| Risk & Return | Compound Return | 7.3% |
| | Standard Deviation | 12.6% |
| | Sharpe Ratio | 0.39 |

- Note assumptions are passive
- The compound return is less than the 7.75% actuarial assumption rate

➤ Stochastic Projection

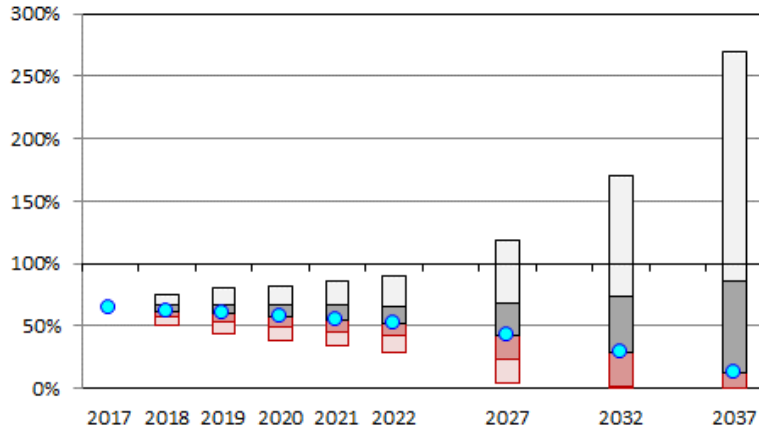
Stochastic Analysis

- Since markets are inherently difficult to predict and do not move in straight lines, we will let the Monte Carlo simulation model dictate rates of return many different ways based on the proposed allocation and its risk / return distribution

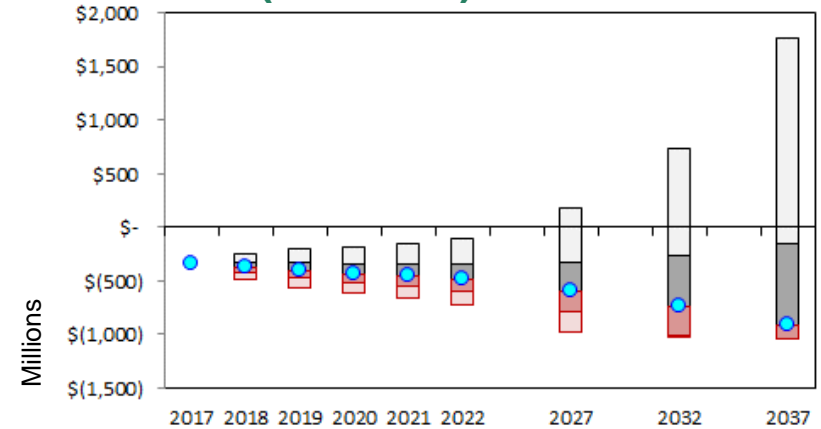


KCPSRS- Current Target Allocation

FUNDED RATIO



(DEFICIT) SURPLUS



- Our forecasts indicate lower returns in the intermediate term
- Median funded status shows substantial deterioration across the horizon
- The probability of insolvency is 2% at the 10 year horizon and increases substantially to 42% at the twenty year horizon

| Funded Ratio | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2027 | 2032 | 2037 |
|---------------------------------|-------|-------|-------|-------|-------|--------------------|--------------------|---------------------|---------------------|
| 95 th | 64% | 75% | 80% | 82% | 85% | 90% 15.8% | 118% 14.1% | 171% 13.5% | 270% 13.4% |
| 75 th | 64% | 67% | 67% | 66% | 66% | 66% 9.7% | 68% 9.7% | 74% 9.9% | 85% 9.9% |
| 50 th | 64% | 62% | 59% | 57% | 55% | 52% 5.7% | 42% 6.5% | 28% 7.0% | 12% 7.3% |
| 25 th | 64% | 57% | 53% | 49% | 45% | 42% 2.4% | 24% 3.6% | 2% 4.2% | 0% 4.7% |
| 5 th | 64% | 51% | 44% | 38% | 34% | 29% -3.0% | 5% -0.7% | 0% 0.4% | 0% 1.1% |
| (Deficit) Surplus | | | | | | | | | |
| 95 th | (349) | (250) | (201) | (178) | (146) | (99) 15.8% | 189 14.1% | 728 13.5% | 1,762 13.4% |
| 75 th | (349) | (331) | (330) | (337) | (339) | (349) 9.7% | (333) 9.7% | (269) 9.9% | (154) 9.9% |
| 50 th | (349) | (377) | (405) | (431) | (454) | (484) 5.7% | (593) 6.5% | (738) 7.0% | (908) 7.3% |
| 25 th | (349) | (424) | (473) | (514) | (551) | (588) 2.4% | (784) 3.6% | (1,010) 4.2% | (1,038) 4.7% |
| 5 th | (349) | (487) | (559) | (619) | (665) | (721) -3.0% | (978) -0.7% | (1,029) 0.4% | (1,038) 1.1% |
| Probability Fully Funded | 0% | 0% | 0% | 1% | 2% | 3% | 9% | 17% | 21% |
| Probability Insolvent | 0% | 0% | 0% | 0% | 0% | 0% | 2% | 23% | 42% |

Blue numbers are compound rates of return

KSPSRS- Current Target Allocation and Possible Mixes

- The current target allocation is well diversified
- The current funded status and contribution rate limits the amount of additional expected return / risk and illiquidity the system could add
- Portfolios A1 and A2 offer modestly more attractive return / risk profiles
- Portfolio A3 achieves assumption return but increases the risk of the portfolio
- Due to the maturity of this Plan and the fixed contribution rates, increasing the risk of the investment portfolio would not be prudent unless a significant change in the contribution rate is achieved

| | | Target | A1 | A2 | A3 |
|----------------------|--------------------------------|--------|--------|--------|--------|
| Fixed Income | Core Fixed Income | 10.0% | 10.0% | 10.0% | 5.0% |
| | High Yield | 2.5% | 2.5% | 5.0% | 5.0% |
| | Emerging Markets Debt (50% LC) | | 2.5% | 5.0% | 5.0% |
| | Global Fixed Income (U) | 5.0% | 2.5% | | |
| Equity | US Equity | 22.5% | 22.5% | 26.0% | 29.0% |
| | Developed Equity (U) | 15.0% | 12.0% | 10.0% | 11.0% |
| | Emerging Markets Equity | 10.0% | 10.0% | 10.0% | 11.0% |
| Alternatives | MACS (GTAA) | 7.5% | 10.5% | 7.5% | 7.5% |
| | Private Equity | 5.0% | 7.5% | 7.5% | 7.5% |
| | Hedge Fund of Funds | 3.0% | 2.5% | 3.0% | 3.0% |
| | Hedge Funds—Equity Long/Short | 4.5% | 2.5% | 3.0% | 3.0% |
| | Commodities | 5.0% | 3.0% | 3.0% | 3.0% |
| | Real Estate (UL) | 10.0% | 12.0% | 10.0% | 10.0% |
| Sum | | 100.0% | 100.0% | 100.0% | 100.0% |
| % Total Fixed Income | | 17.5% | 17.5% | 20.0% | 15.0% |
| % Total Equity | | 47.5% | 44.5% | 46.0% | 51.0% |
| % Total Alternatives | | 35.0% | 38.0% | 34.0% | 34.0% |
| Risk & Return | Compound Return | 7.3% | 7.5% | 7.6% | 7.7% |
| | Standard Deviation | 12.6% | 12.4% | 12.7% | 13.6% |
| | Sharpe Ratio | 0.39 | 0.41 | 0.41 | 0.40 |

Next Steps

- Discuss contribution strategy and effects
- Make a decision regarding increasing contributions
- The current target mix is very well diversified with Segal Marco Advisors (SMA) recommendations at the margin
- Make a decision regarding a possible new mix

Next Steps

➤ Education

- Emerging Markets Debt

➤ SMA recommends an optimization of the equity and fixed portfolio

- Make small changes to the targets in US and Non-US equities
- Rebalance the fixed portfolio to take advantage of opportunities in EMD
- Increase Private Equity slightly through Secondary investments
- Slightly increase real estate
- Reduce Target to Commodities and Hedge Funds
- Increase MACS (GTAA)

➤ Portfolio Transition

- Fixed Income
 - Transition Brandywine to a more EMD focused strategy
 - Reduce Global Fixed portion of Brandywine
- Equities
 - No manager changes needed to accommodate asset allocation
 - Ongoing review of managers to determine optimum line-up
- Real Estate
 - Remove Global REITs
 - Add new Opportunistic/Value Add Manager

Next Steps

➤ Portfolio Transition *continued*

- Hedge Fund of Funds
 - Reduce allocation
- MACS (GTAA)
 - Possibly add a new manager
- Private Equity
 - Add a new secondaries manager

➤ Adjust Investment Policy Statement to Reflect New Asset Class Targets and Ranges

- Consider the role of MACS (GTAA) relative to targets and Permitted Ranges

➤ Envisioned Searches

- Private Equity Secondaries (1)
- MACS (GTAA) Manager (1)
- Real Estate Value Add/Oppportunistic (1)

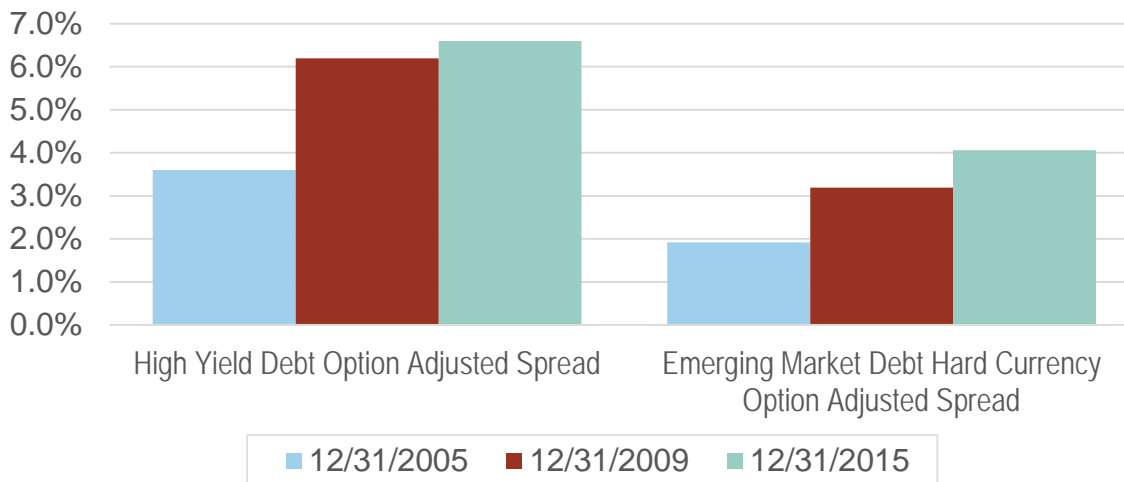
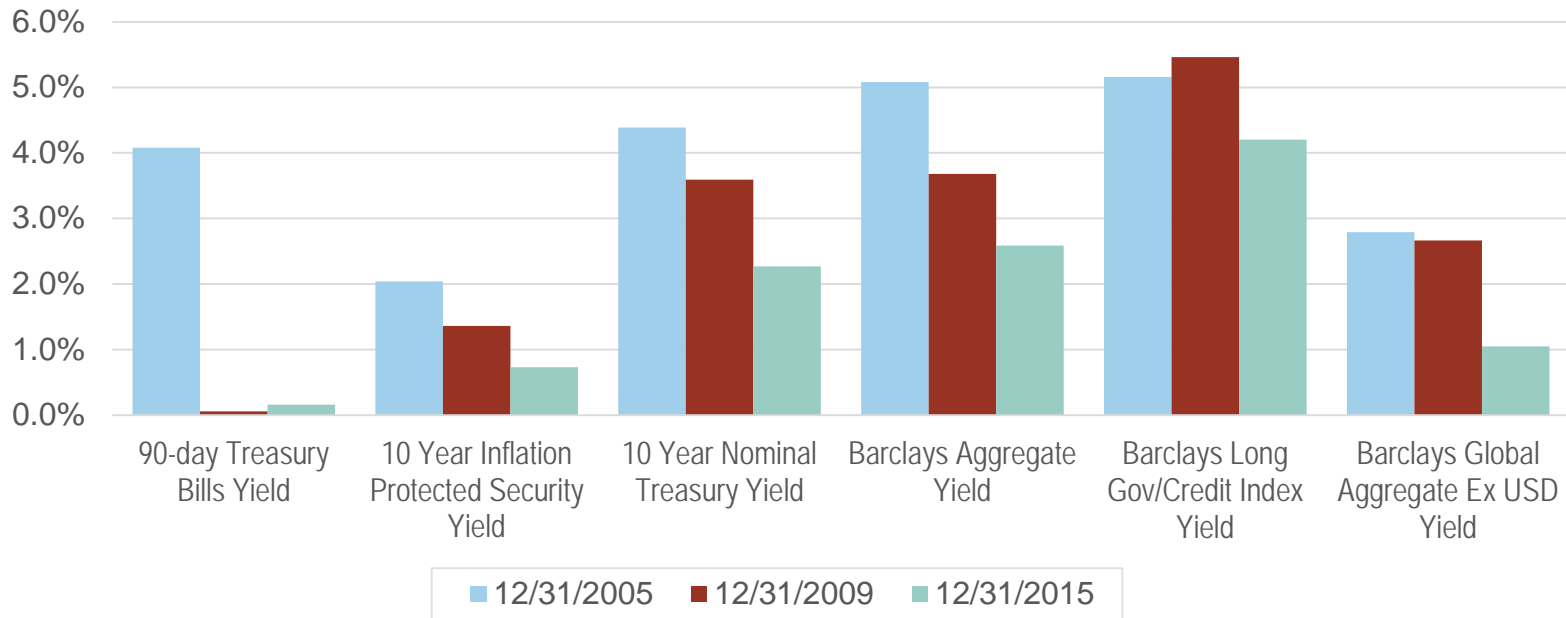
➤ Appendix

Assumptions

- All cashflows and contributions were provided by the actuary
- The cashflows were modeled deterministically and do not reflect changes due to inflation and trend experience
- Capital market assumptions based on preliminary 2017 assumptions and Segal Marco Advisors proprietary stochastic forecast model

Financial Market Indicators

Charts



Capital Market Assumptions

HISTORICAL EXCESS RETURN

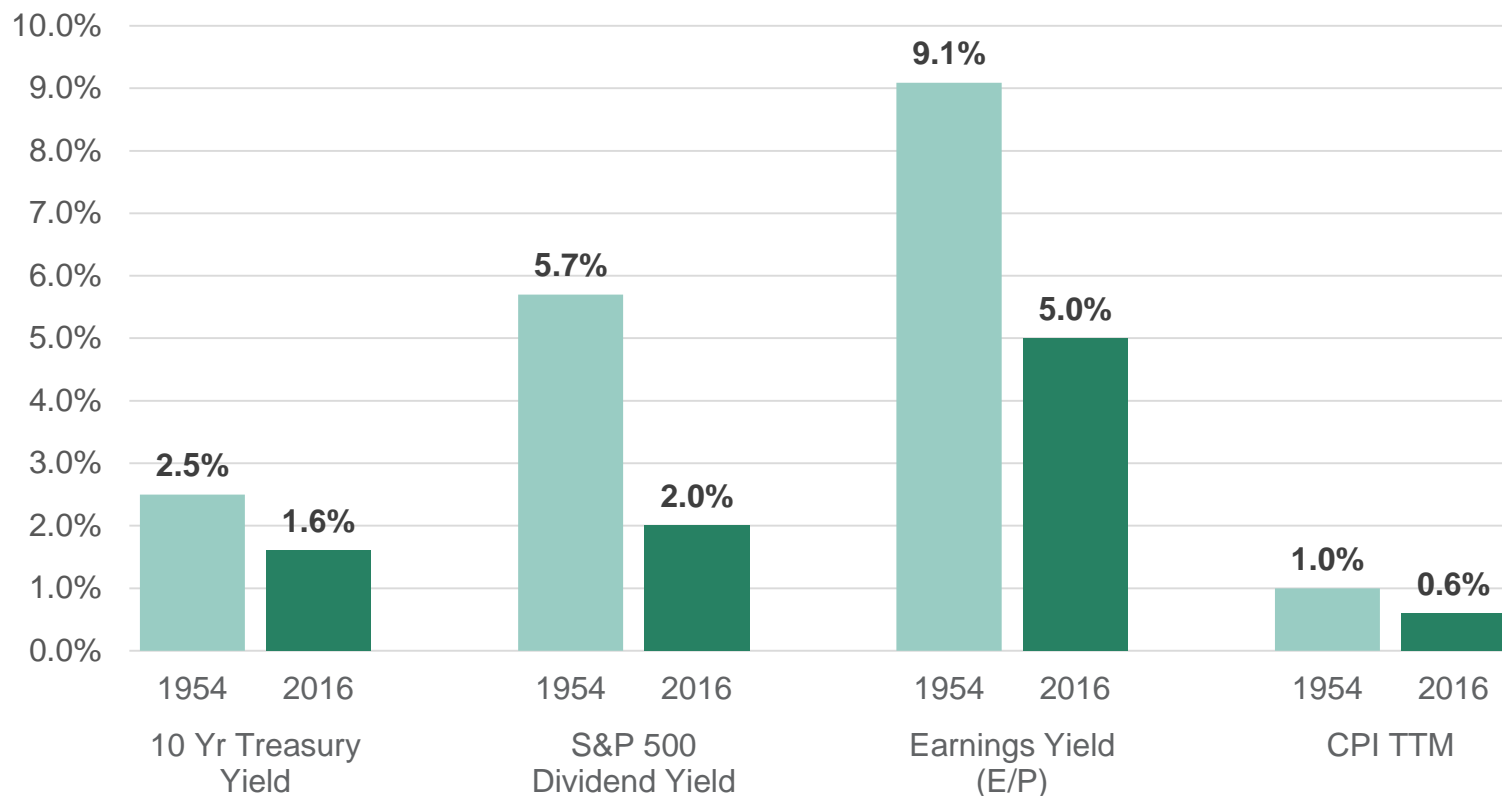
| | Arithmetic Average | | Geometric Average | |
|-----------------------|--------------------|-----------------|-------------------|-----------------|
| | Stocks—T. Bills | Stocks—T. Bonds | Stocks—T. Bills | Stocks—T. Bonds |
| 1928 – 2015 | 7.92% | 6.18% | 6.05% | 4.54% |
| <i>Standard Error</i> | 2.15% | 2.29% | | |
| 1966 – 2015 | 6.05% | 3.89% | 4.69% | 2.90% |
| <i>Standard Error</i> | 2.42% | 2.74% | | |
| 2006 – 2015 | 7.87% | 3.88% | 6.11% | 2.53% |
| <i>Standard Error</i> | 6.06% | 8.66% | | |

- Note: our US Equity forward-looking (arithmetic) risk premium is 5.6% = 8.8% (US Equity 20yr) – 3.2% (Cash 20yr)
- **Which is lower than various historical periods: 7.92%, 6.05% and 7.87%**

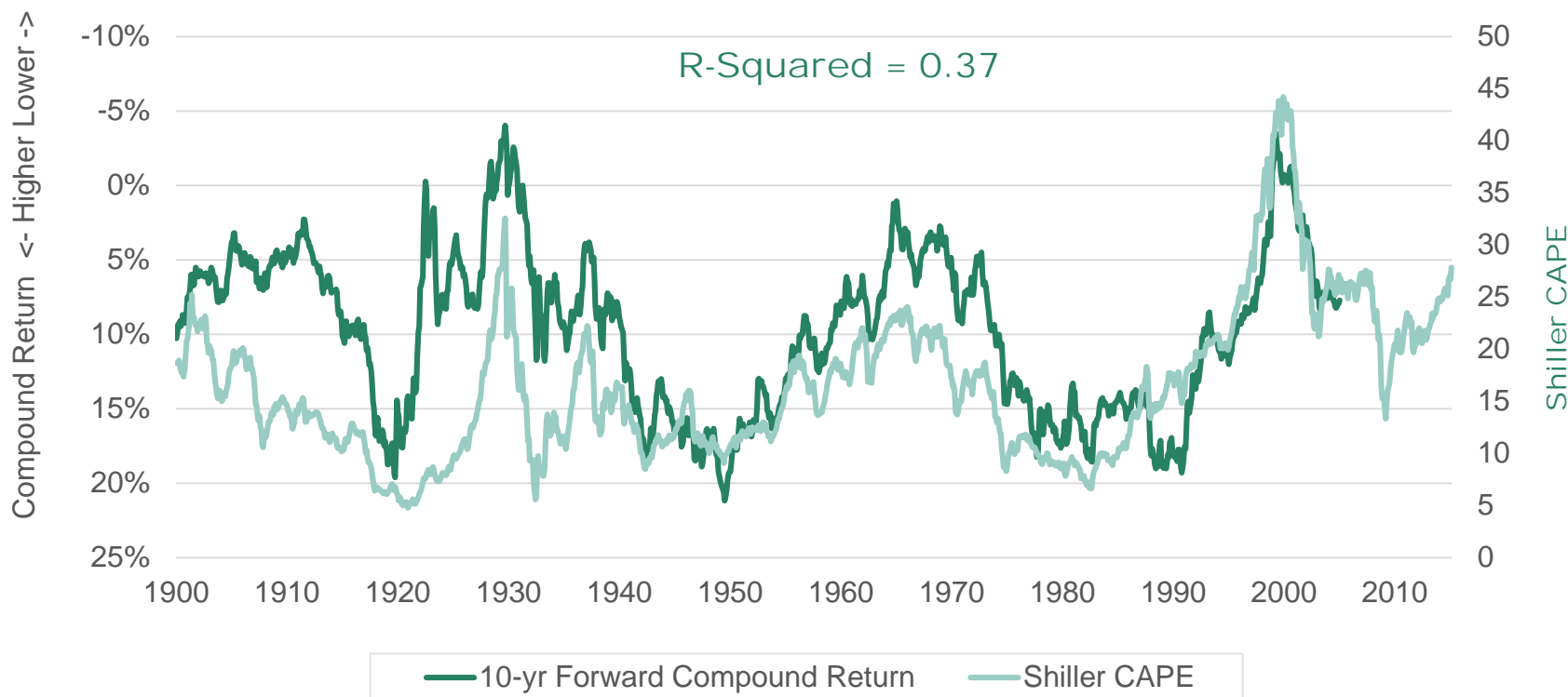
Equity Prices Today

- While the bond market's return outlook is modest, US equity markets have to a degree reflected this

1950s LOW RATE ENVIRONMENT VERSUS TODAY



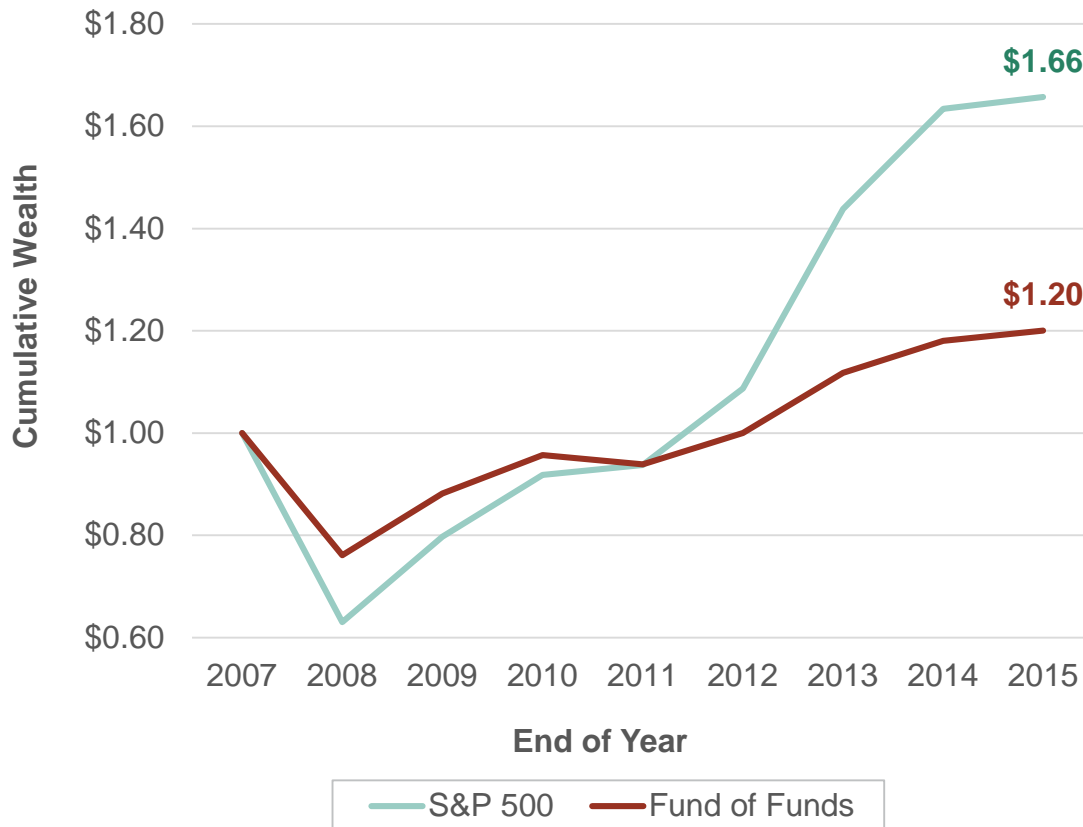
Shiller Cyclical Adjusted Price Earnings Ratio (CAPE)



- The Shiller CAPE ratio is a strong predictor of long-term future equity returns
- Cheap valuations (low CAPE ratios) have led to strong secular bull markets
- Expensive valuations (high CAPE ratios) led to strong secular bear markets
- Equities are on the expensive side today

Hedge Funds

- Hedge funds in particular have faced criticism recently... some warranted some not
- Let's look at the "Buffett Bet" performance so far



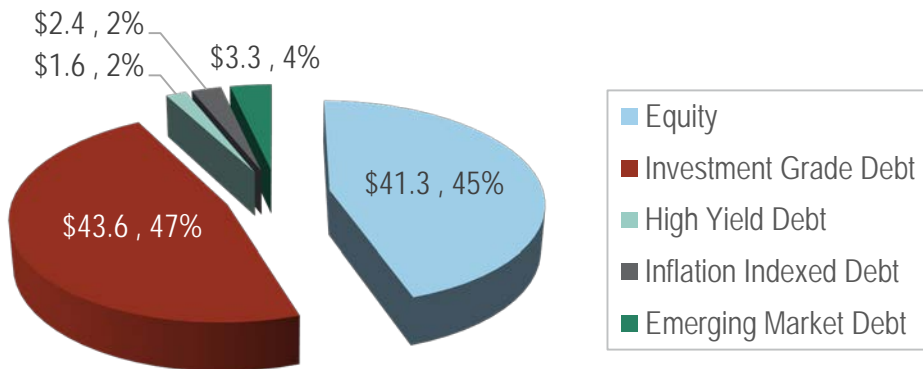
| | S&P 500 | Fund of Funds | Alpha |
|----------|---------|---------------|--------------|
| μ | 6.5% | 2.3% | -1.9% |
| σ | 21.3% | 12.2% | 2.5% |
| ρ | 1.0 | 1.0 | 0.0 |
| β | 1.0 | 0.6 | |

Asset Class Proxies

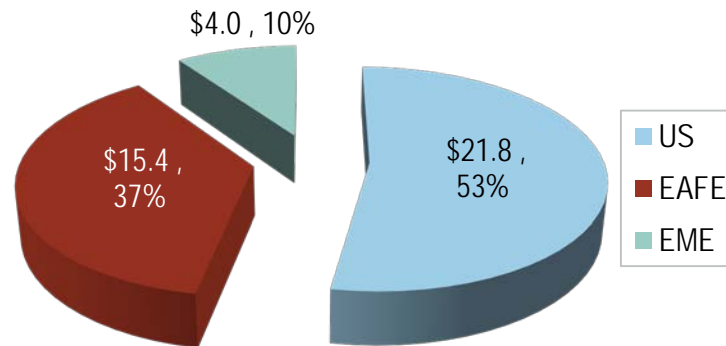
| | Asset Class | Index |
|--------------|---|---|
| Fixed—Income | Cash | 90 Day Tbills |
| | U.S. Inflation Linked Bonds | Barclays Capital U.S. Treasury: U.S. Tips |
| | Core Fixed Income | Barclays Capital Aggregate |
| | Dev. Markets Fixed Income (U) | Citigroup Non-U.S. World Government Bond (U) |
| | High Yield Debt | Citigroup High Yield |
| | Emerging Market Debt (50% Local Currency) | 50% JP Morgan Emerging Markets Bond Index+ / 50% JP Morgan Global Bond Index |
| | Municipal Bonds | Barclays Capital Municipal Bond |
| | Global Fixed Income (U) | Barclays Capital Global Aggregate |
| | Long-term Fixed Income | Barclays Capital U.S. Long Gov/Credit |
| Equity | U.S. Equity | Russell 3000 |
| | Non-U.S. Developed Equity (U) | Morgan Stanley Capital International (MSCI) EAFE (U) |
| | Emerging Markets Equity | S&P/International Finance Corporation Investable (IFCI) Composite |
| | Global Equity (U) | Morgan Stanley Capital International (MSCI) World (U) |
| | Global REITs | FTSE EPRA / National Association of Real Estate Trusts (Nareit) Global Real Estate |
| Alternatives | Private Equity | Venture Economics - All Private Equity U.S. |
| | Hedge Fund of Funds | Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index |
| | Equity Long/Short | Hedge Fund Research, Inc. (HFRI) Equity Hedge (Total) Index |
| | Credit-Event -Driven | 50% Hedge Fund Research, Inc. (HFRI) Relative Value (Total) Index + / 50% Hedge Fund Research, Inc. (HFRI) Event-Driven (Total) Index |
| | Global Macro | Hedge Fund Research, Inc. (HFRI) Macro (Total) Index |
| | Commodities | Bloomberg Commodity Index |
| | Real Estate | National Council of Real Estate Investment Fiduciaries (NCREIF) Property |
| Real Assets | Timberland | National Council of Real Estate Investment Fiduciaries (NCREIF) Timber |
| | Farmland | National Council of Real Estate Investment Fiduciaries (NCREIF) Farmland |
| | Oil & Gas | S&P Oil & Gas Exploration & Production Select Industry |
| | Infrastructure | UBS Developed Infrastructure |

Global Investible Market Portfolio (Liquid)

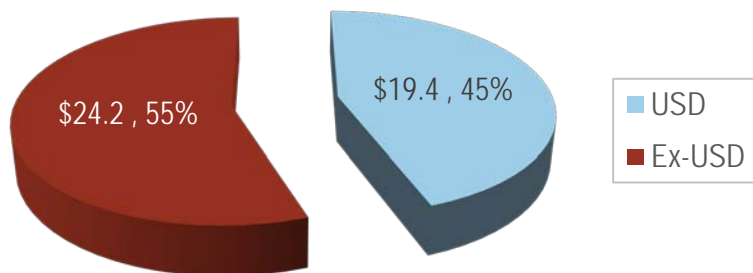
GLOBAL INVESTIBLE MARKET PORTFOLIO (Liquid) (T) \$92.2



EQUITY MSCI ACWI IMI (T) \$41.3



INVESTMENT GRADE FIXED INCOME



- The global market portfolio (GMP) has an important role in capital market theory
- Theoretically, it could represent the most efficient (highest Sharpe ratio) portfolio
- We use it as an important benchmark for our capital market assumptions

Asset Class Proxies

| Correlation | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Asset Class | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Cash | 1 | 1.00 | -0.08 | -0.16 | 0.01 | -0.22 | -0.06 | -0.23 | -0.04 | -0.14 | -0.15 | -0.07 | -0.02 | -0.11 | -0.08 | -0.02 | -0.11 | -0.13 | -0.17 | 0.00 | 0.02 | 0.18 | 0.11 | 0.22 | -0.04 | -0.05 |
| Inflation Linked Bonds | 2 | -0.08 | 1.00 | 0.76 | 0.58 | 0.40 | 0.57 | 0.45 | 0.68 | 0.65 | 0.18 | 0.25 | 0.29 | 0.23 | 0.33 | 0.02 | 0.20 | 0.19 | 0.25 | 0.12 | 0.34 | -0.01 | -0.02 | -0.29 | 0.17 | 0.30 |
| Core Fixed Income | 3 | -0.16 | 0.76 | 1.00 | 0.60 | 0.27 | 0.48 | 0.55 | 0.72 | 0.92 | 0.06 | 0.14 | 0.14 | 0.11 | 0.26 | -0.27 | -0.02 | 0.01 | 0.05 | 0.04 | 0.06 | -0.25 | -0.03 | -0.16 | -0.08 | 0.26 |
| Dev. Mkts. Fixed Income (u) | 4 | 0.01 | 0.58 | 0.60 | 1.00 | 0.25 | 0.56 | 0.24 | 0.96 | 0.49 | 0.22 | 0.41 | 0.34 | 0.33 | 0.38 | -0.09 | 0.12 | 0.21 | 0.14 | 0.32 | 0.39 | -0.19 | -0.06 | -0.15 | 0.16 | 0.41 |
| High Yield | 5 | -0.22 | 0.40 | 0.27 | 0.25 | 1.00 | 0.71 | 0.38 | 0.38 | 0.17 | 0.75 | 0.75 | 0.73 | 0.77 | 0.82 | 0.63 | 0.63 | 0.75 | 0.81 | 0.14 | 0.48 | -0.05 | -0.16 | -0.14 | 0.50 | 0.67 |
| Emerging Markets Debt (50% LC) | 6 | -0.06 | 0.57 | 0.48 | 0.56 | 0.71 | 1.00 | 0.36 | 0.68 | 0.38 | 0.67 | 0.78 | 0.81 | 0.75 | 0.81 | 0.51 | 0.57 | 0.67 | 0.64 | 0.29 | 0.56 | 0.03 | -0.08 | -0.05 | 0.47 | 0.75 |
| Municipal Bonds | 7 | -0.23 | 0.45 | 0.55 | 0.24 | 0.38 | 0.36 | 1.00 | 0.34 | 0.49 | 0.14 | 0.15 | 0.14 | 0.15 | 0.25 | 0.03 | 0.16 | 0.13 | 0.23 | 0.01 | -0.04 | -0.20 | -0.02 | -0.21 | 0.02 | 0.25 |
| Global Fixed Income (u) | 8 | -0.04 | 0.68 | 0.72 | 0.96 | 0.38 | 0.68 | 0.34 | 1.00 | 0.59 | 0.31 | 0.49 | 0.44 | 0.42 | 0.48 | -0.02 | 0.20 | 0.31 | 0.26 | 0.31 | 0.42 | -0.18 | -0.05 | -0.17 | 0.20 | 0.50 |
| Long-Term Fixed Income | 9 | -0.14 | 0.65 | 0.92 | 0.49 | 0.17 | 0.38 | 0.49 | 0.59 | 1.00 | 0.00 | 0.07 | 0.07 | 0.04 | 0.20 | -0.29 | -0.05 | -0.07 | -0.02 | 0.03 | -0.01 | -0.10 | 0.02 | -0.09 | -0.13 | 0.21 |
| US Equity | 10 | -0.15 | 0.18 | 0.06 | 0.22 | 0.75 | 0.67 | 0.14 | 0.31 | 0.00 | 1.00 | 0.88 | 0.80 | 0.97 | 0.87 | 0.77 | 0.71 | 0.86 | 0.78 | 0.25 | 0.52 | 0.26 | -0.03 | -0.02 | 0.59 | 0.80 |
| Developed Equity (u) | 11 | -0.07 | 0.25 | 0.14 | 0.41 | 0.75 | 0.78 | 0.15 | 0.49 | 0.07 | 0.88 | 1.00 | 0.90 | 0.97 | 0.88 | 0.75 | 0.78 | 0.90 | 0.83 | 0.39 | 0.63 | 0.19 | -0.02 | 0.04 | 0.63 | 0.88 |
| Emerging Markets Equity | 12 | -0.02 | 0.29 | 0.14 | 0.34 | 0.73 | 0.81 | 0.14 | 0.44 | 0.07 | 0.80 | 0.90 | 1.00 | 0.88 | 0.82 | 0.71 | 0.80 | 0.91 | 0.81 | 0.44 | 0.65 | 0.10 | -0.08 | 0.06 | 0.63 | 0.79 |
| Global Equity (u) | 13 | -0.11 | 0.23 | 0.11 | 0.33 | 0.77 | 0.75 | 0.15 | 0.42 | 0.04 | 0.97 | 0.97 | 0.88 | 1.00 | 0.90 | 0.79 | 0.78 | 0.91 | 0.83 | 0.35 | 0.61 | 0.23 | -0.03 | 0.01 | 0.63 | 0.87 |
| Global REITs | 14 | -0.08 | 0.33 | 0.26 | 0.38 | 0.82 | 0.81 | 0.25 | 0.48 | 0.20 | 0.87 | 0.88 | 0.82 | 0.90 | 1.00 | 0.69 | 0.64 | 0.78 | 0.74 | 0.22 | 0.52 | 0.21 | -0.10 | -0.06 | 0.53 | 0.84 |
| Private Equity | 15 | -0.02 | 0.02 | -0.27 | -0.09 | 0.63 | 0.51 | 0.03 | -0.02 | -0.29 | 0.77 | 0.75 | 0.71 | 0.79 | 0.69 | 1.00 | 0.78 | 0.80 | 0.79 | 0.21 | 0.56 | 0.52 | 0.05 | 0.07 | 0.64 | 0.67 |
| Hedge Fund of Funds | 16 | -0.11 | 0.20 | -0.02 | 0.12 | 0.63 | 0.57 | 0.16 | 0.20 | -0.05 | 0.71 | 0.78 | 0.80 | 0.78 | 0.64 | 0.78 | 1.00 | 0.91 | 0.91 | 0.57 | 0.65 | 0.26 | 0.00 | 0.12 | 0.65 | 0.69 |
| Equity Long/Short | 17 | -0.13 | 0.19 | 0.01 | 0.21 | 0.75 | 0.67 | 0.13 | 0.31 | -0.07 | 0.86 | 0.90 | 0.91 | 0.91 | 0.78 | 0.80 | 0.91 | 1.00 | 0.93 | 0.48 | 0.67 | 0.15 | -0.05 | 0.06 | 0.72 | 0.76 |
| Credit-Event -Driven | 18 | -0.17 | 0.25 | 0.05 | 0.14 | 0.81 | 0.64 | 0.23 | 0.26 | -0.02 | 0.78 | 0.83 | 0.81 | 0.83 | 0.74 | 0.79 | 0.91 | 0.93 | 1.00 | 0.35 | 0.62 | 0.14 | -0.12 | -0.03 | 0.66 | 0.71 |
| Global Macro | 19 | 0.00 | 0.12 | 0.04 | 0.32 | 0.14 | 0.29 | 0.01 | 0.31 | 0.03 | 0.25 | 0.39 | 0.44 | 0.35 | 0.22 | 0.21 | 0.57 | 0.48 | 0.35 | 1.00 | 0.50 | -0.04 | -0.02 | 0.28 | 0.36 | 0.34 |
| Commodities | 20 | 0.02 | 0.34 | 0.06 | 0.39 | 0.48 | 0.56 | -0.04 | 0.42 | -0.01 | 0.52 | 0.63 | 0.65 | 0.61 | 0.52 | 0.56 | 0.65 | 0.67 | 0.62 | 0.50 | 1.00 | 0.27 | -0.16 | -0.05 | 0.70 | 0.49 |
| Real Estate | 21 | 0.18 | -0.01 | -0.25 | -0.19 | -0.05 | 0.03 | -0.20 | -0.18 | -0.10 | 0.26 | 0.19 | 0.10 | 0.23 | 0.21 | 0.52 | 0.26 | 0.15 | 0.14 | -0.04 | 0.27 | 1.00 | 0.29 | 0.08 | 0.24 | 0.24 |
| Timber | 22 | 0.11 | -0.02 | -0.03 | -0.06 | -0.16 | -0.08 | -0.02 | -0.05 | 0.02 | -0.03 | -0.02 | -0.08 | -0.03 | -0.10 | 0.05 | 0.00 | -0.05 | -0.12 | -0.02 | -0.16 | 0.29 | 1.00 | 0.57 | -0.05 | -0.05 |
| Farmland | 23 | 0.22 | -0.29 | -0.16 | -0.15 | -0.14 | -0.05 | -0.21 | -0.17 | -0.09 | -0.02 | 0.04 | 0.06 | 0.01 | -0.06 | 0.07 | 0.12 | 0.06 | -0.03 | 0.28 | -0.05 | 0.08 | 0.57 | 1.00 | -0.08 | -0.07 |
| Oil & Gas | 24 | -0.04 | 0.17 | -0.08 | 0.16 | 0.50 | 0.47 | 0.02 | 0.20 | -0.13 | 0.59 | 0.63 | 0.63 | 0.63 | 0.53 | 0.64 | 0.65 | 0.72 | 0.66 | 0.36 | 0.70 | 0.24 | -0.05 | -0.08 | 1.00 | 0.51 |
| Infrastructure | 25 | -0.05 | 0.30 | 0.26 | 0.41 | 0.67 | 0.75 | 0.25 | 0.50 | 0.21 | 0.80 | 0.88 | 0.79 | 0.87 | 0.84 | 0.67 | 0.69 | 0.76 | 0.71 | 0.34 | 0.49 | 0.24 | -0.05 | -0.07 | 0.51 | 1.00 |