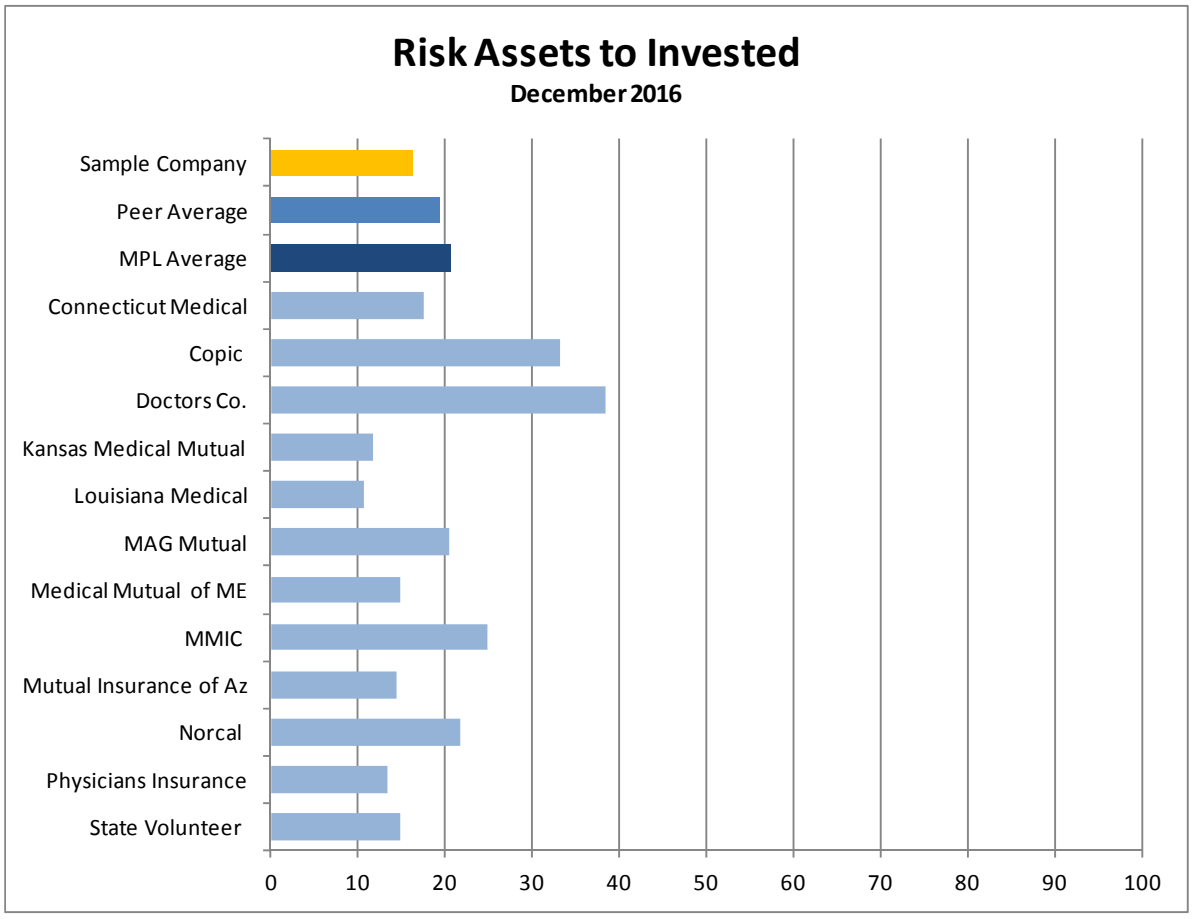
PEER ANALYTICS

# DFA PEER RISK ANALYSIS

# MPL SAMPLE

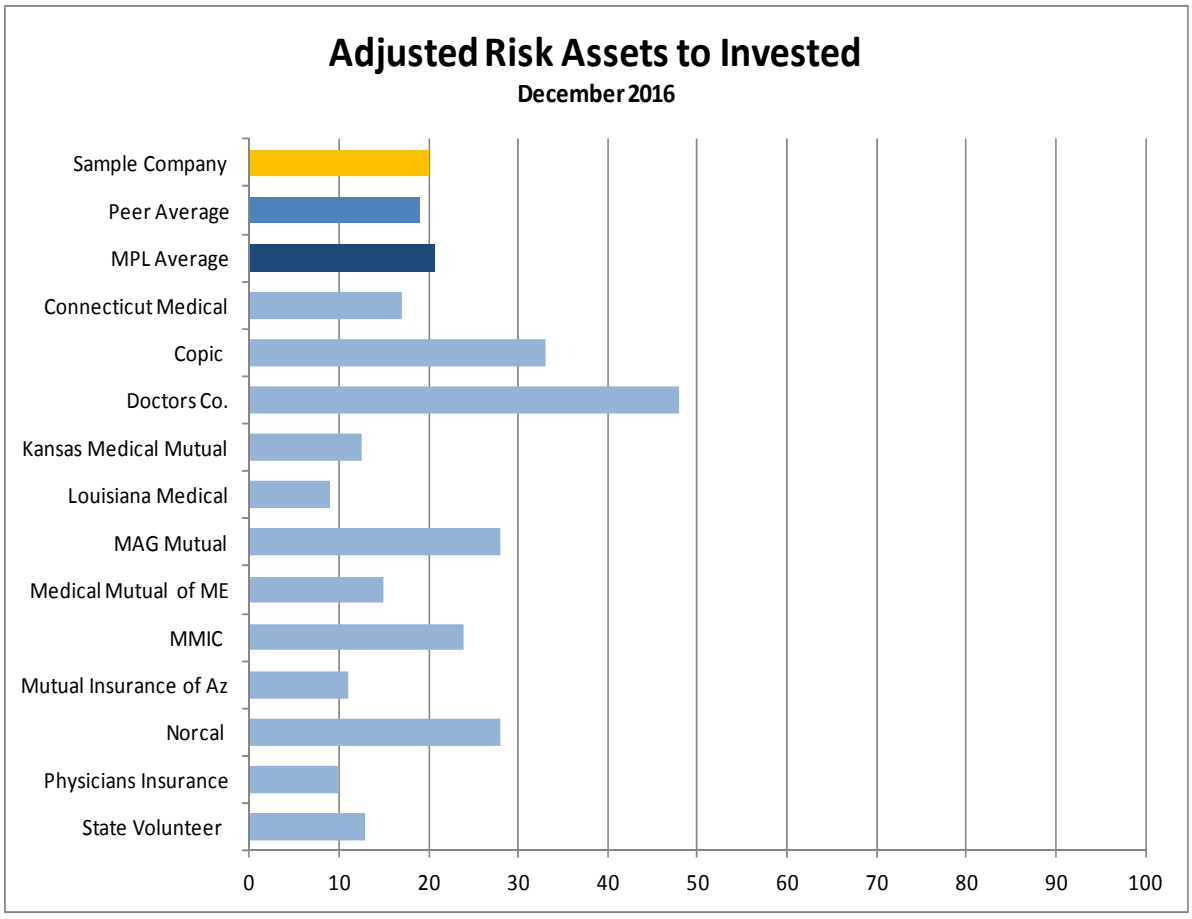
FOR THE PERIOD ENDING DECEMBER 2016

# Investment Risk



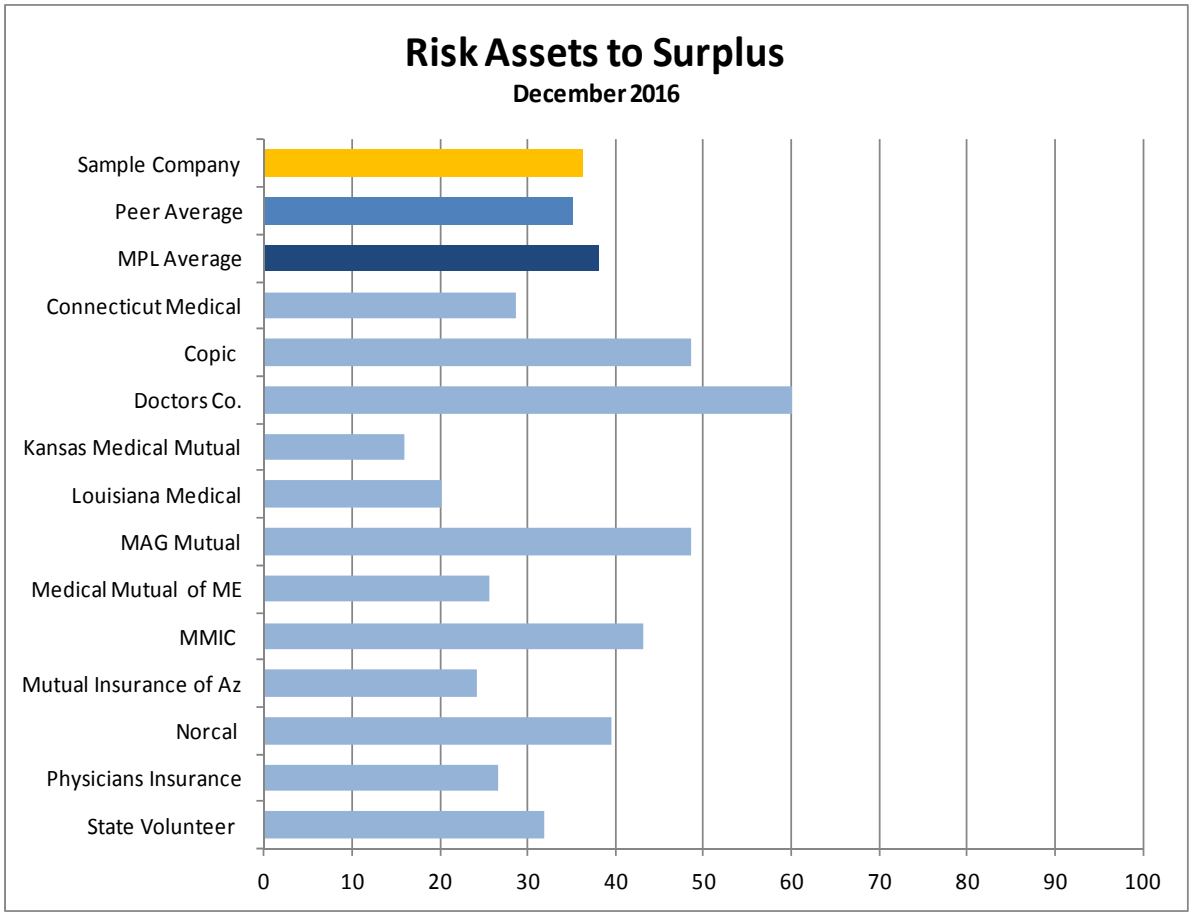

Sample Company's 2016 allocation to risky assets (common stock, international and emerging market equity, high yield bonds and hedge funds/private equity) is less than its peer company median.

# Investment Risk




Equity allocations adjusted to reflect actual point-in-time risk of individual peer company equity portfolios (domestic, international and emerging mkts). Current equity risk is calculated using ABW Peer Analytics' Statistical Equity Risk Models.

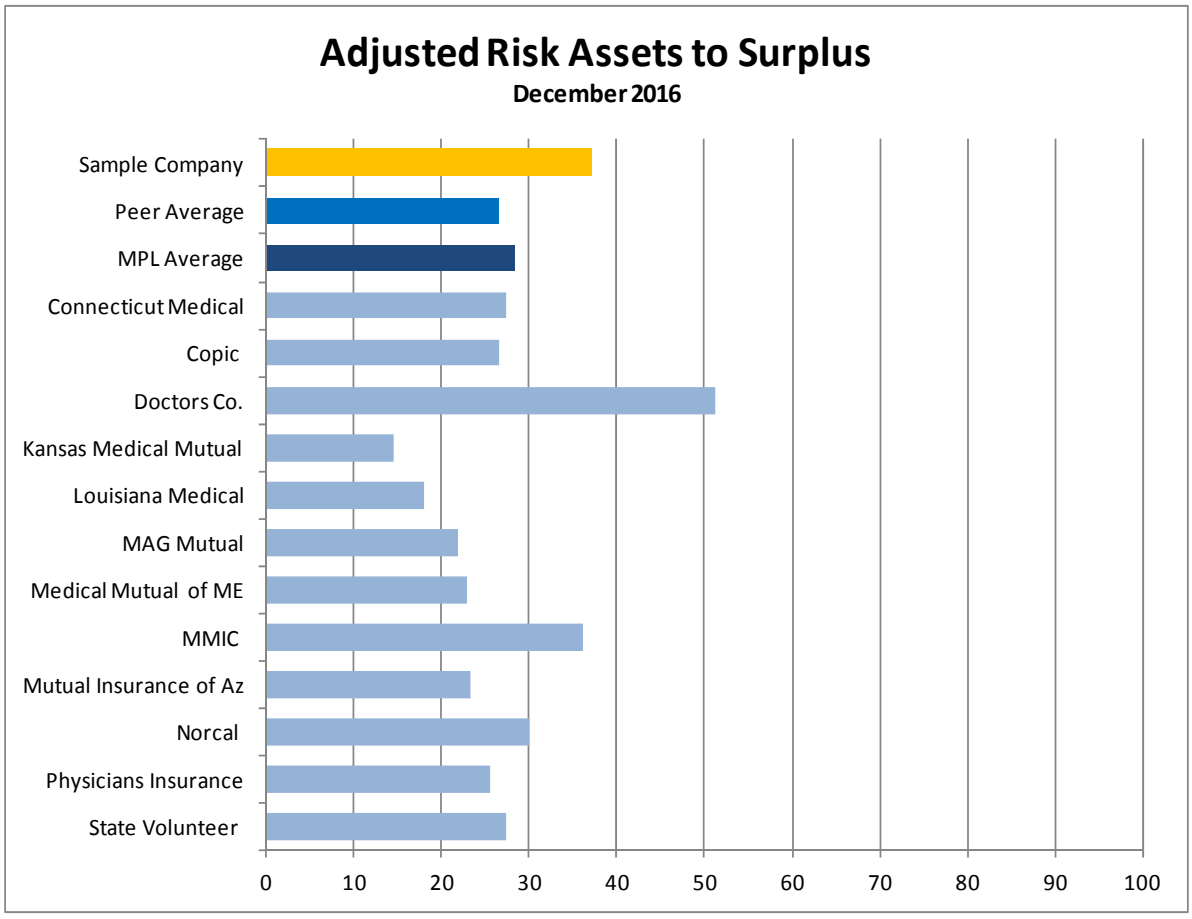
# Investment Risk




This chart shows 2016 allocation to risk assets relative to surplus.

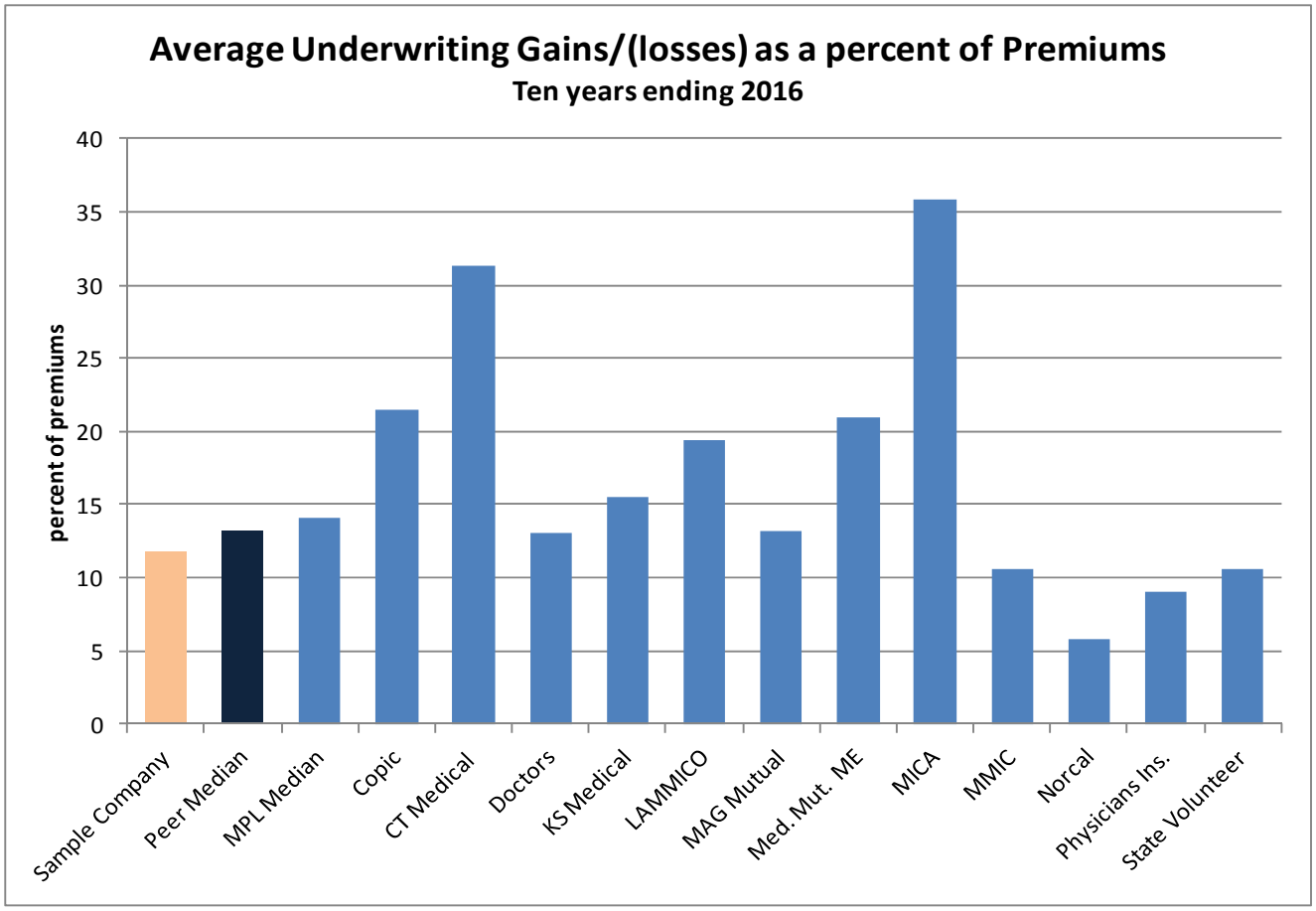
Sample Company's 2016 allocation to risky assets (common stock, high yield bonds and hedge funds/private equity) is greater than its peer company median.

# Investment Risk




This chart shows 2016 allocation to risk assets relative to surplus, equity allocations adjusted to reflect current risk of each company's equity portfolio. Current equity risk is calculated using ABW Peer Analytics' Statistical Equity Risk Models.

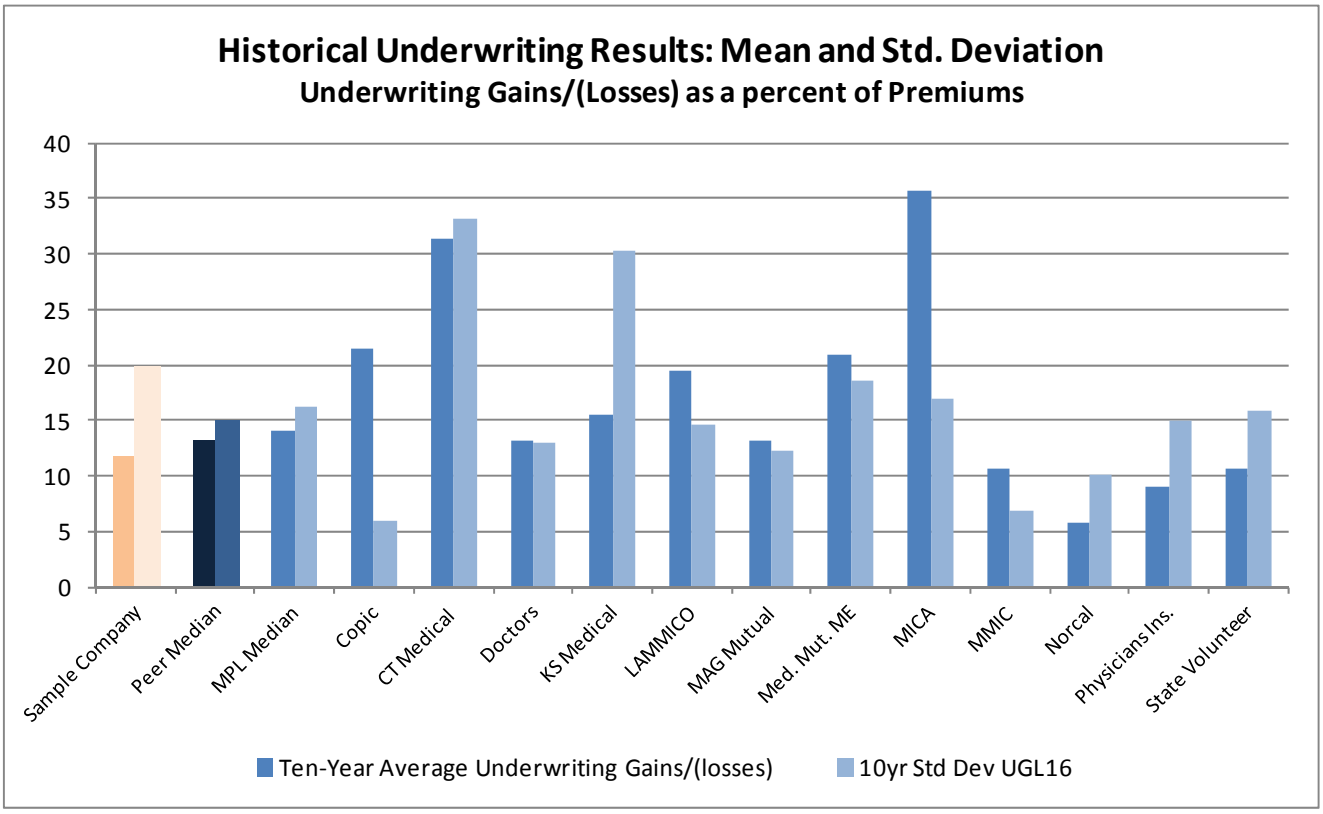
# Liability Risk: Average Underwriting Gains
## as a Percent of Premiums




This chart shows historical ten-year average underwriting gains/(losses) as a percent of premiums.

Sample Company's historical underwriting gains were less than its peer median.

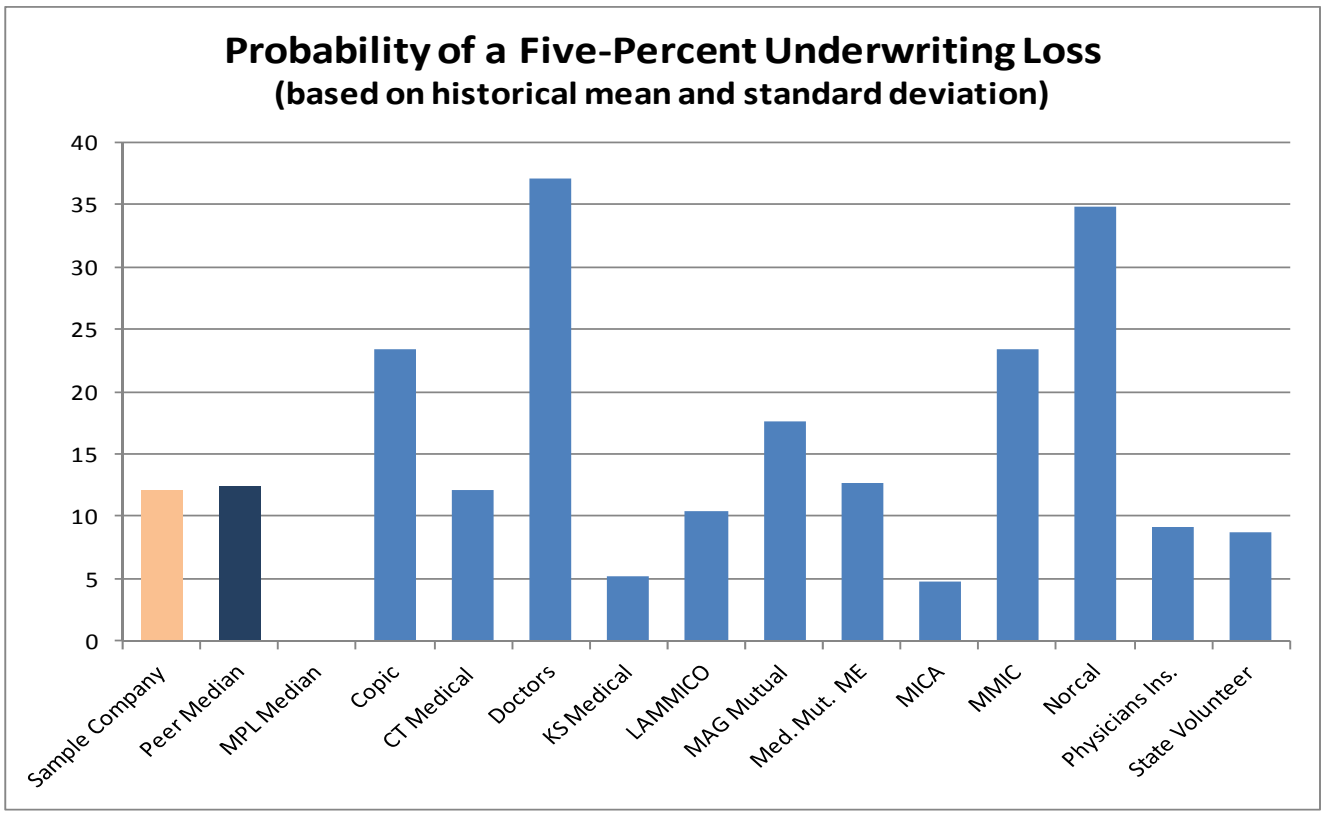
# Liability Risk: Underwriting Gains/Losses
## Mean and Standard Deviation




This chart shows historical ten-year average underwriting gains/(losses) as a percent of premiums, as well as its historical variability.

Sample Company's historical underwriting gains were less than its peer median, with more variability.

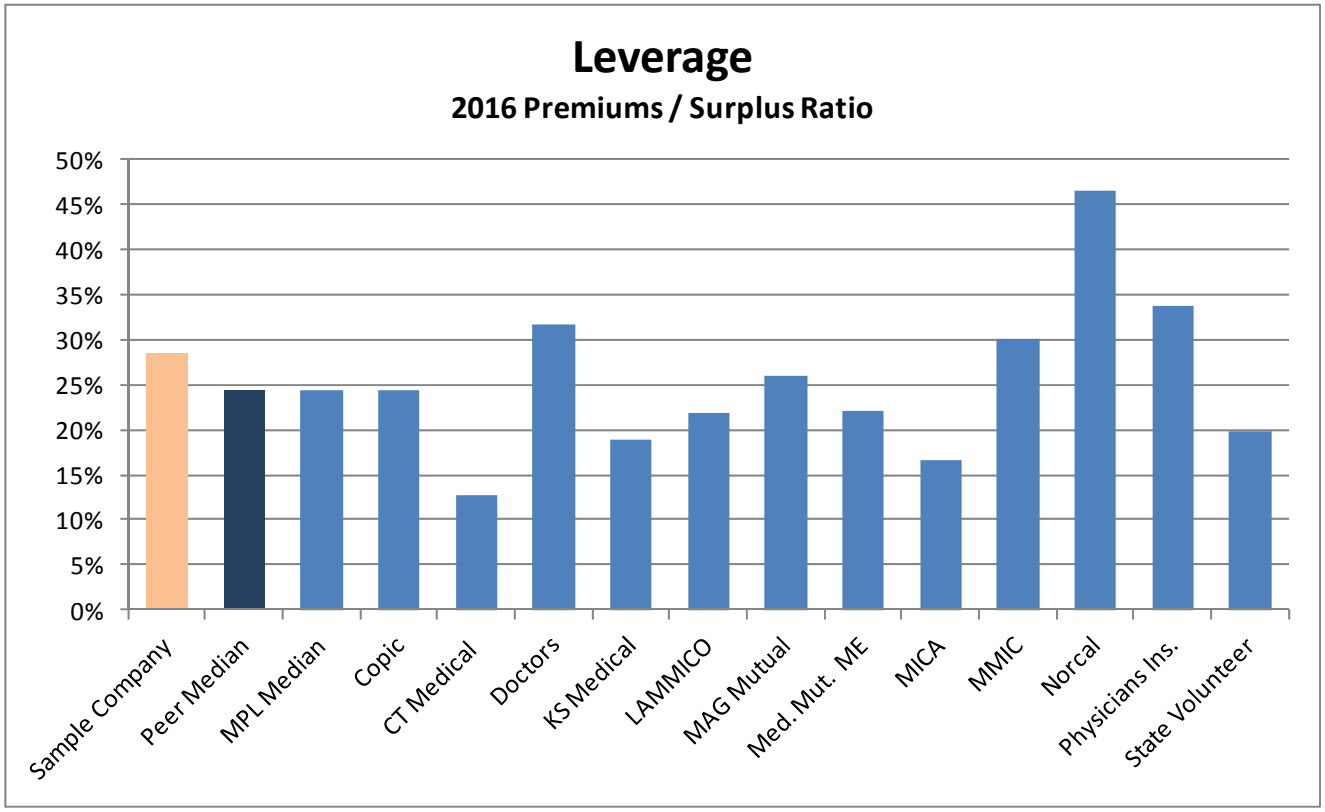
# Liability Risk: Probability of Underwriting Loss




This chart shows the probability of an annual five-percent underwriting loss, based on historical mean and standard deviation.

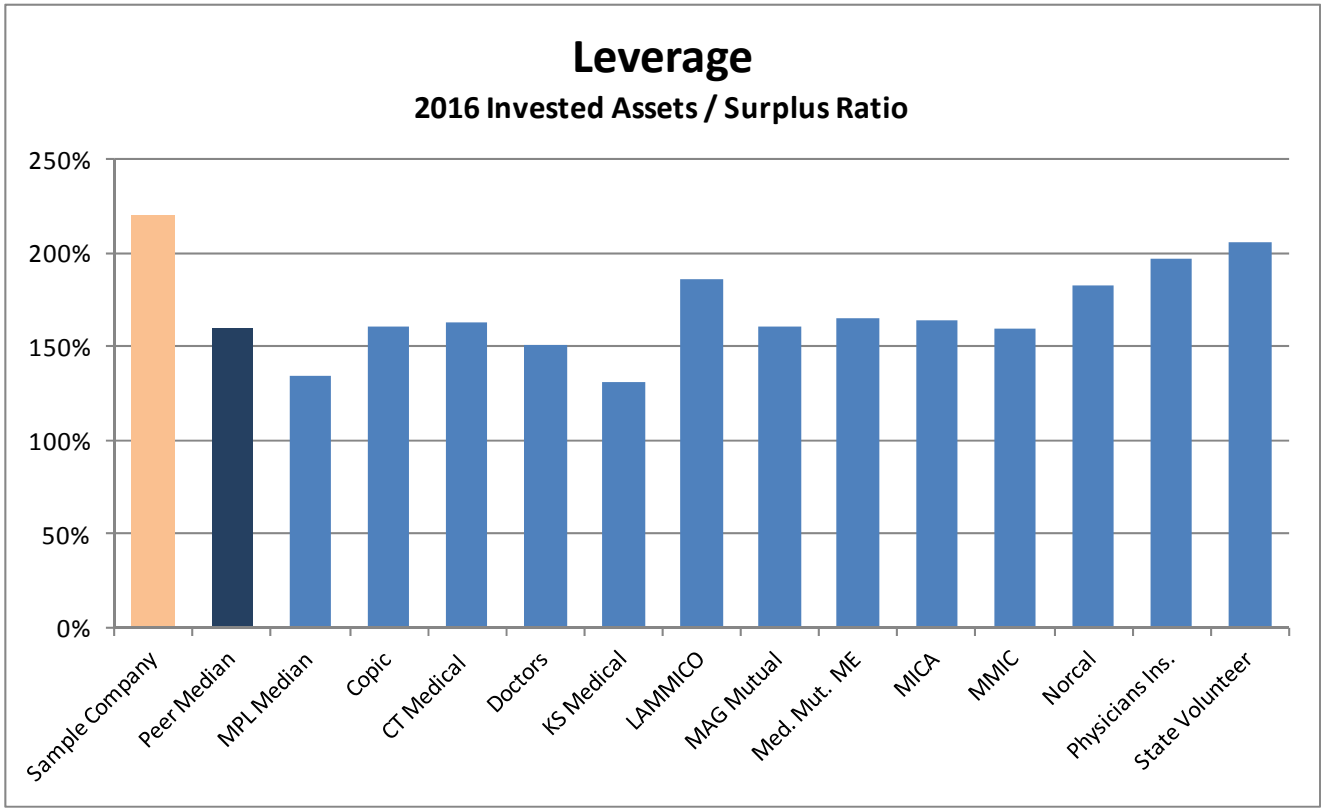
Sample Company's underwriting risk from this perspective is significantly greater than its peer company median.

# Underwriting Leverage: Premiums to Surplus



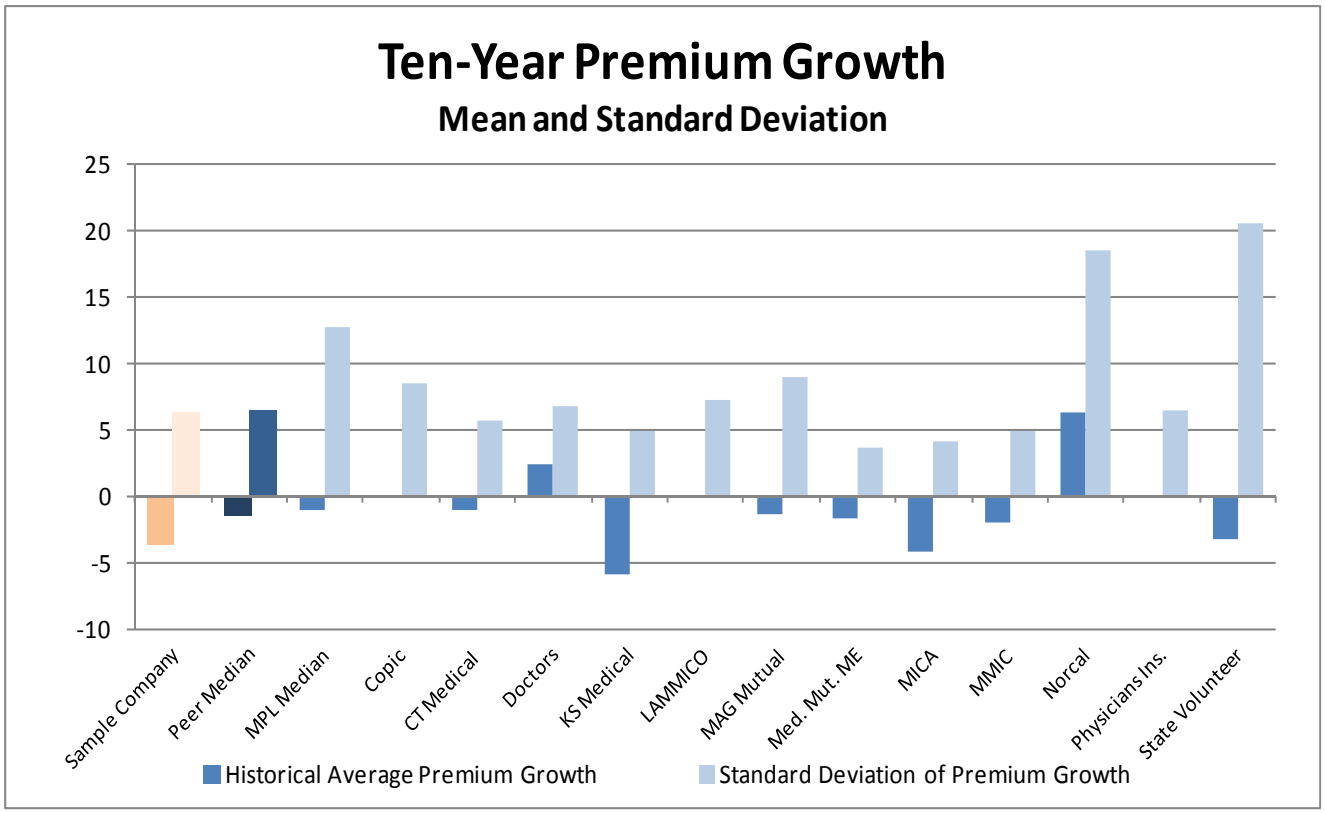

Sample Company's underwriting leverage - 2016 premiums written to surplus ratio – is slightly greater than its peer company median.

# Investment Leverage: Net Assets to Surplus



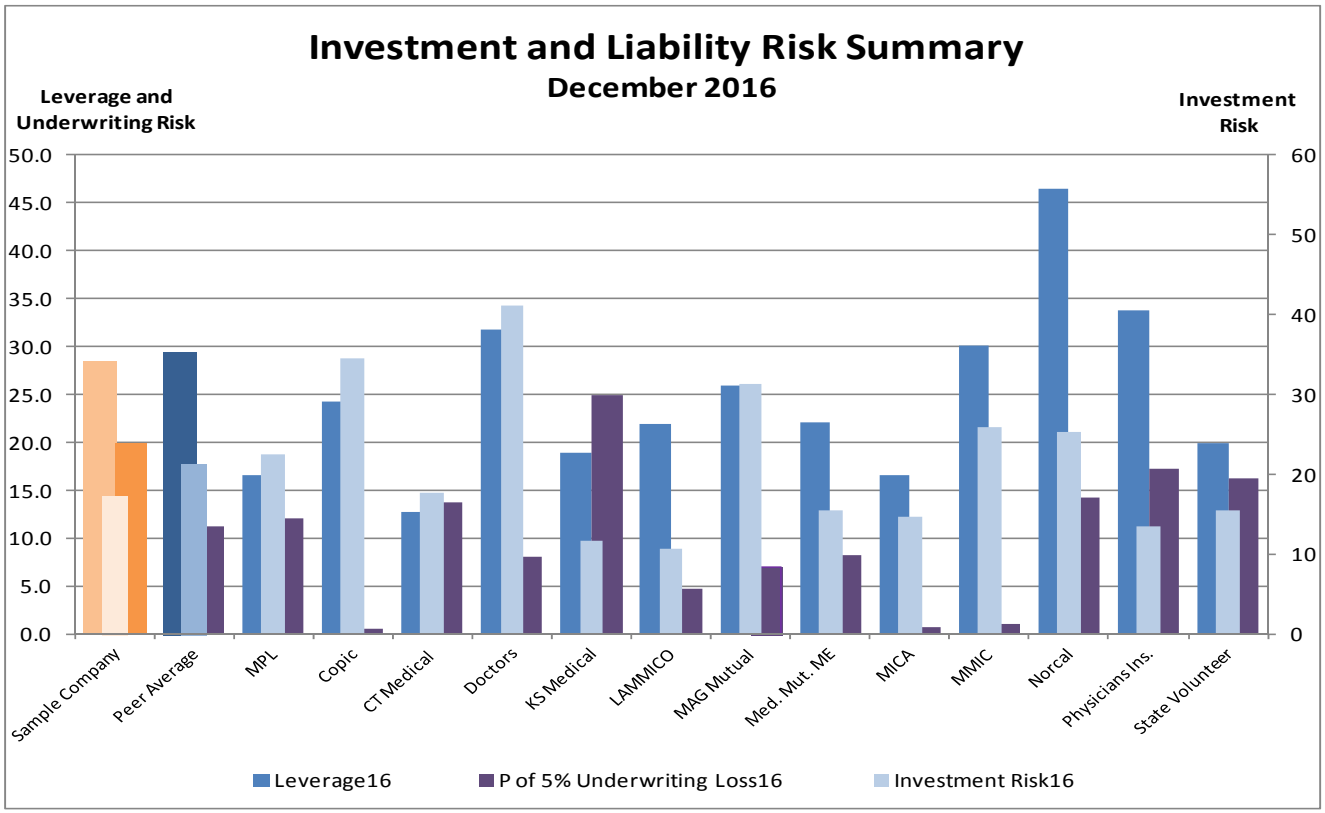

Sample Company's investment leverage - 2016 net invested assets to surplus ratio – is greater than its peer company median.

# Historical Premium Growth




This chart shows average ten-year historical premium growth rates, as well as growth rate variability.

# Liability Risk Summary




This chart summarizes the three primary risk drivers of DFA simulation analysis that were depicted in more detail in previous exhibits. Expected underwriting gain/loss and its variability is transformed to probability of a five-percent underwriting loss for ease of comparison. Investment risk is defined as year-end allocation to risky assets (common, international, and preferred stock, high yield bonds and hedge funds/private equity).

# Peer Company DFA Risk Simulations

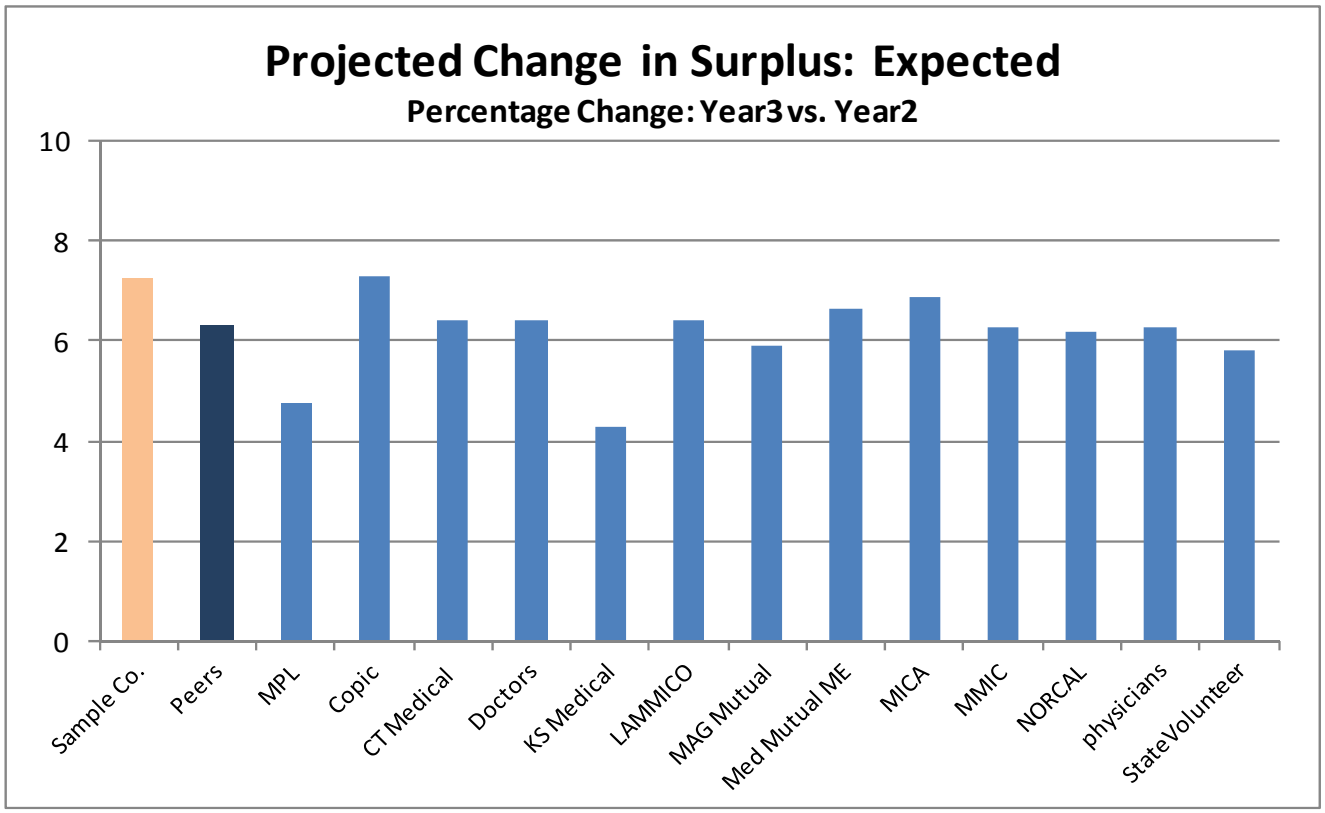
## Capital Market Assumptions

| Asset Class | Expected Return | Risk | Sharpe Ratio |
|---|---|---|---|
| Cash | 0.5 | 1.0 | NA |
| Bonds | 4.0 | 6.0 | 0.58 |
| High Yield | 6.0 | 14.0 | 0.39 |
| Large Cap Stocks | 8.0 | 21.0 | 0.36 |
| Int'l Stocks | 8.0 | 24.0 | 0.31 |
| Small Cap Stocks | 9.0 | 24.0 | 0.35 |
| Emerging Markets | 10.0 | 34.0 | 0.28 |

## Liability Assumptions

| | |
|---|---|
| **Premium Growth Rates** | Average and Standard Deviations |
| **Underwriting Gains / (Losses) as a percent of premiums** | of Ten-Year Historical Results |
| **Premiums** | |
| **Invested Assets** | 2016 Year-End Values |
| **Surplus** | |

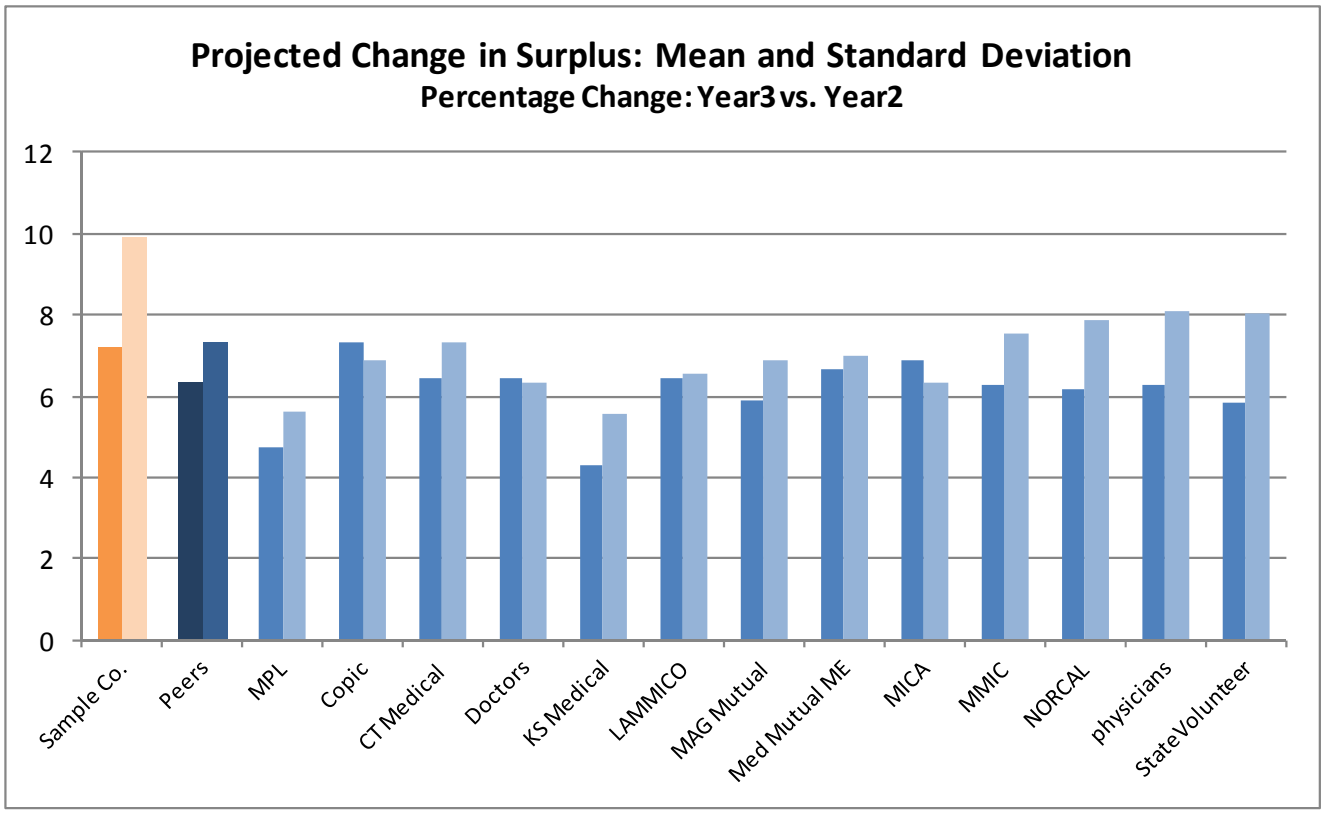
# Projected Surplus: Expected Change




This chart shows the expected percentage change in surplus in year three relative to year two, based on DFA simulation analysis.

Sample Company's expected increase in surplus is greater than its peer median.

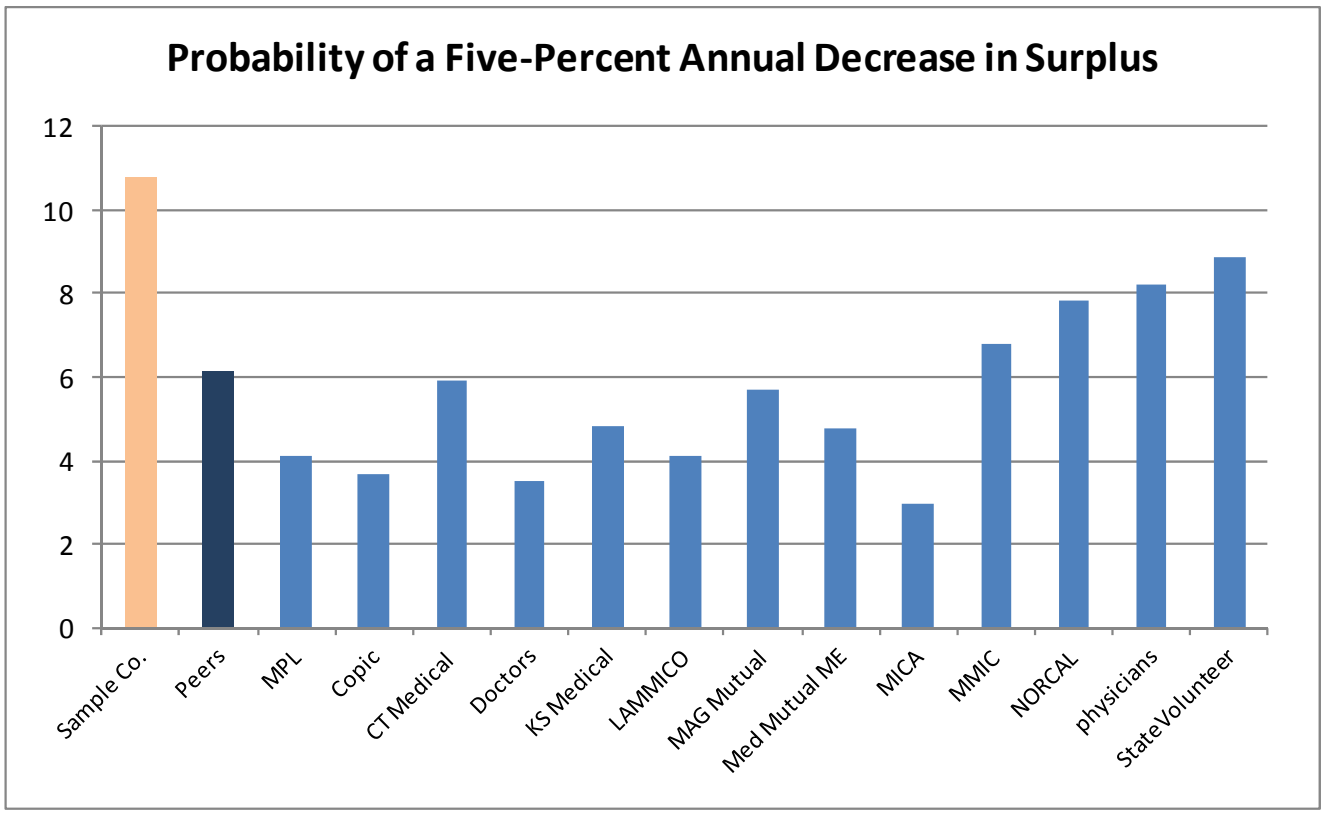
# Projected Surplus: Expected and Risk




This chart shows the expected percentage change in surplus in year three relative to year two, as well as the potential variability of the same.

Sample Company's expected increase in surplus is greater than its peer median, with greater variability.

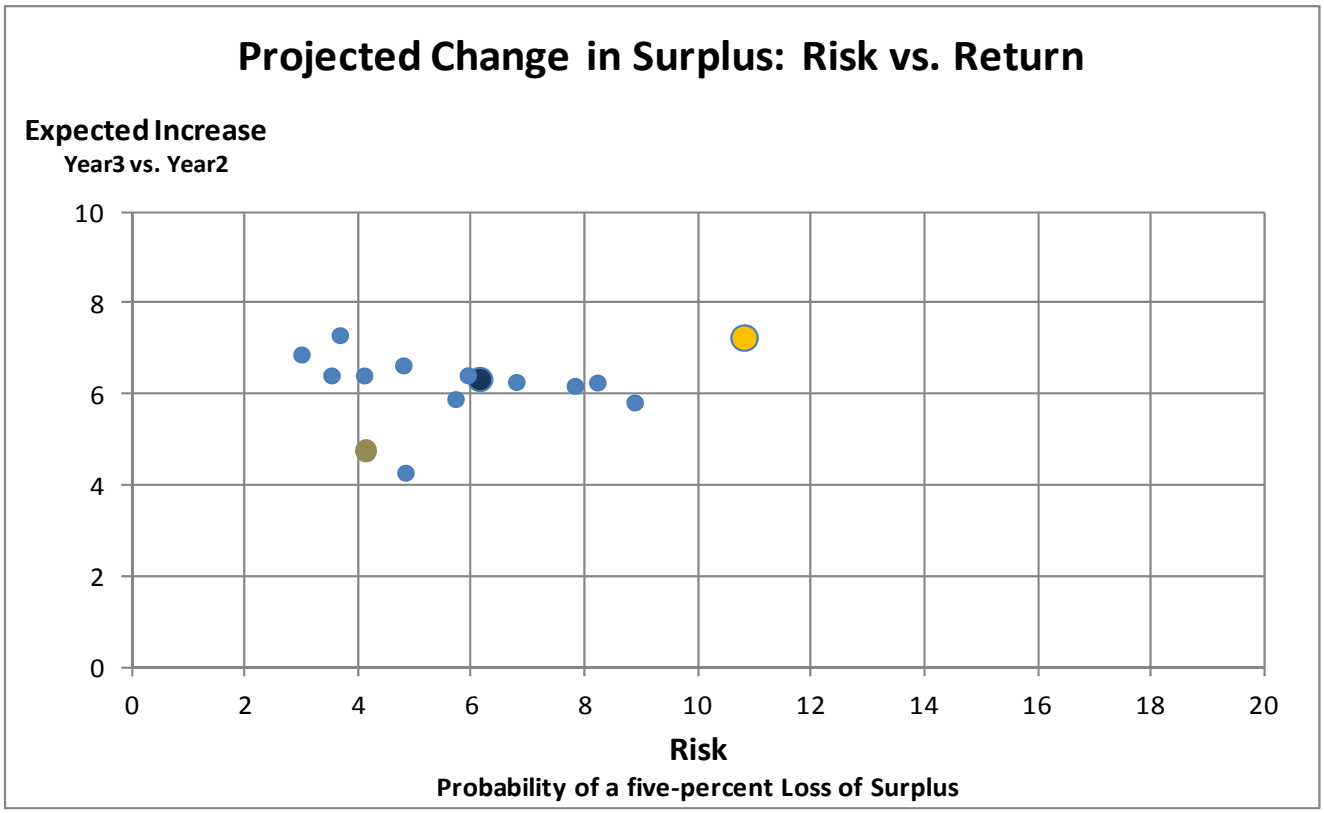
# Projected Surplus: Risk




This chart shows the probability of a decrease is surplus of five percent or more (year 3 versus year 2).

Sample Company's surplus risk, from this perspective, is significantly greater than that of its peer median.

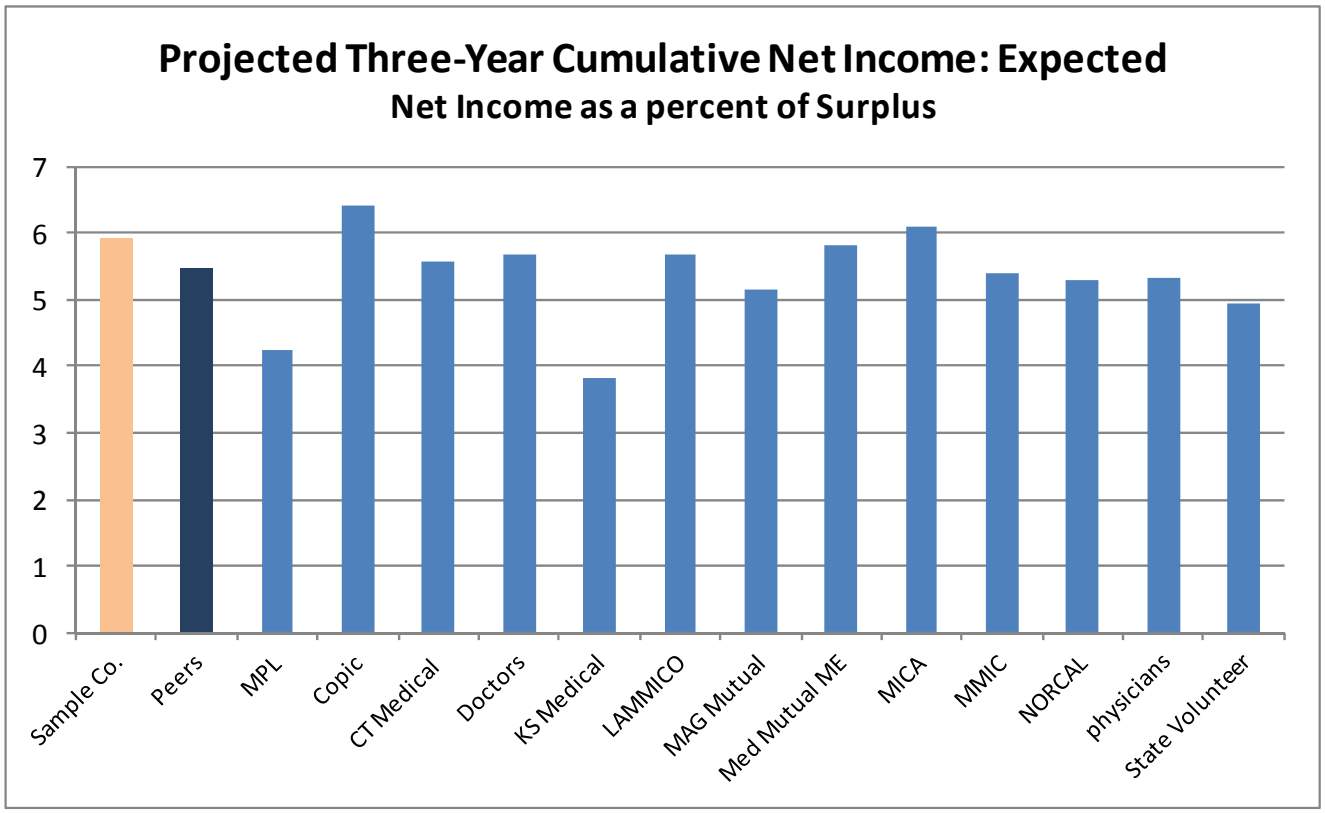
# Projected Surplus: Risk vs. Return




This chart shows the tradeoff between surplus risk (the probability of a five-percent surplus loss) and return (expected increase in surplus).

Sample Company's surplus risk return posture is greater risk, greater expected return.

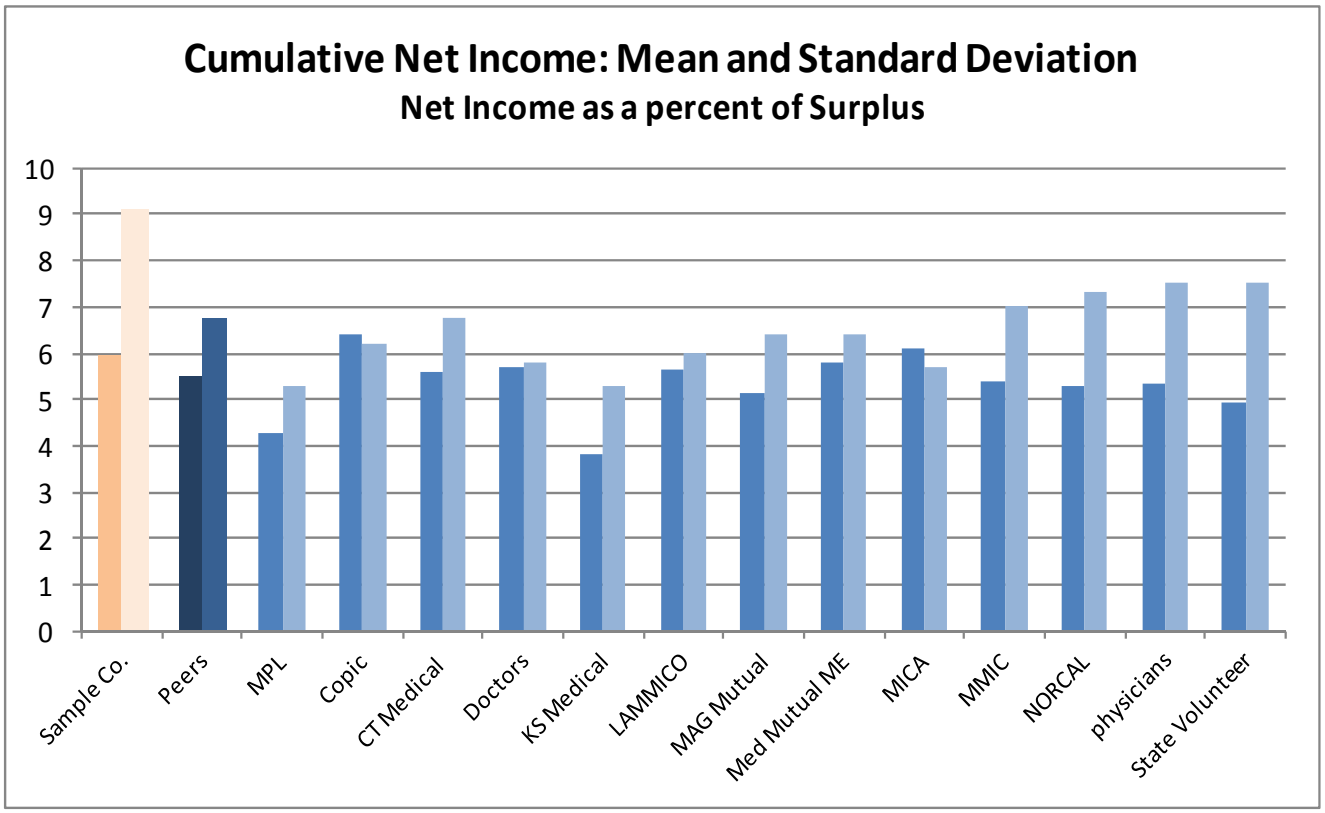
# Projected Net Income: Expected




This chart shows expected three-year cumulative net income as a percent of surplus.

Sample Company's expected cumulative net income as a percent of surplus is greater than its peer company median.

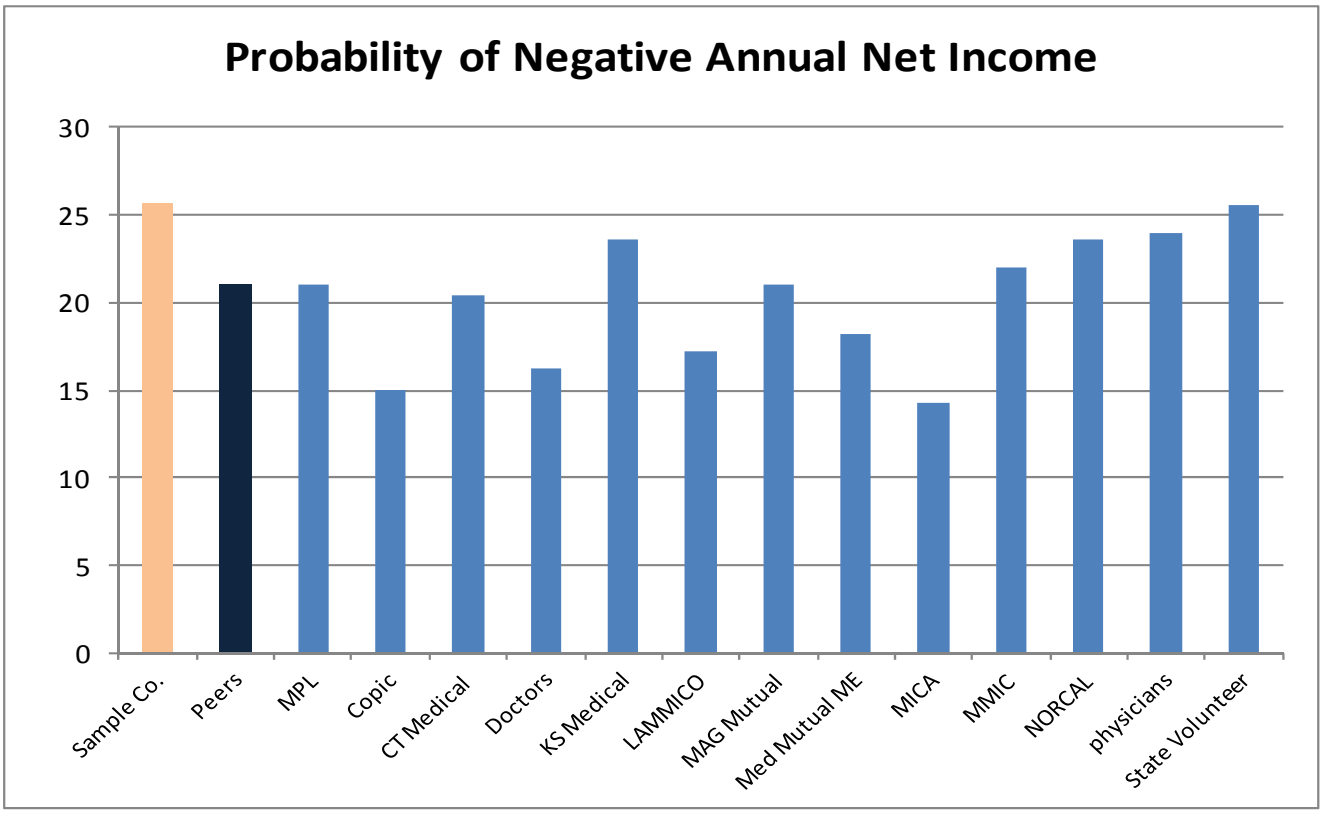
# Net Income: Expected and Risk




This chart shows expected three-year cumulative net income as a percent of surplus, as well as the potential variability of the same.

Sample Company's expected cumulative net income is greater than its peer median, with greater expected variability.

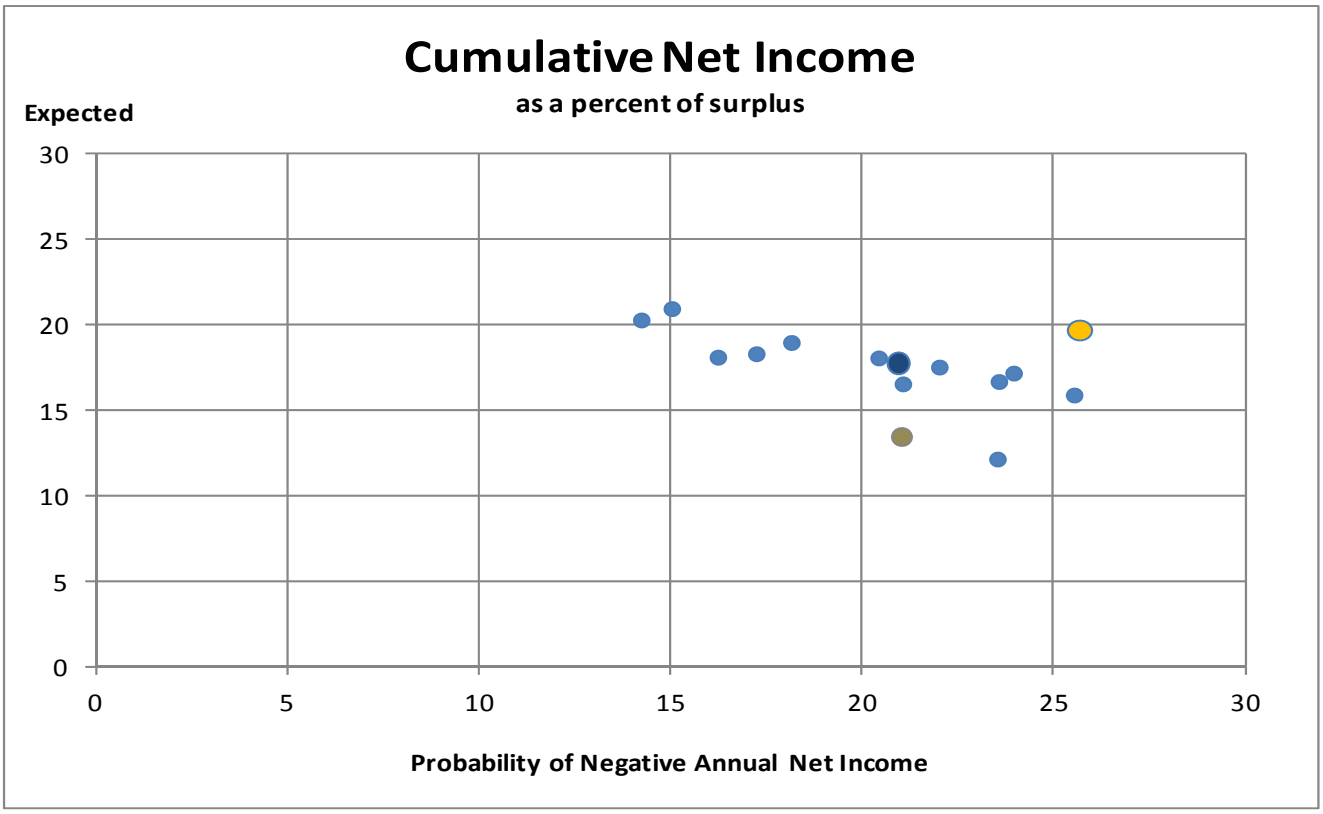
# Projected Cumulative Net Income




This chart shows the probability of negative annual net income.

Sample Company has greater exposure to the risk of negative net income than its peer company median.

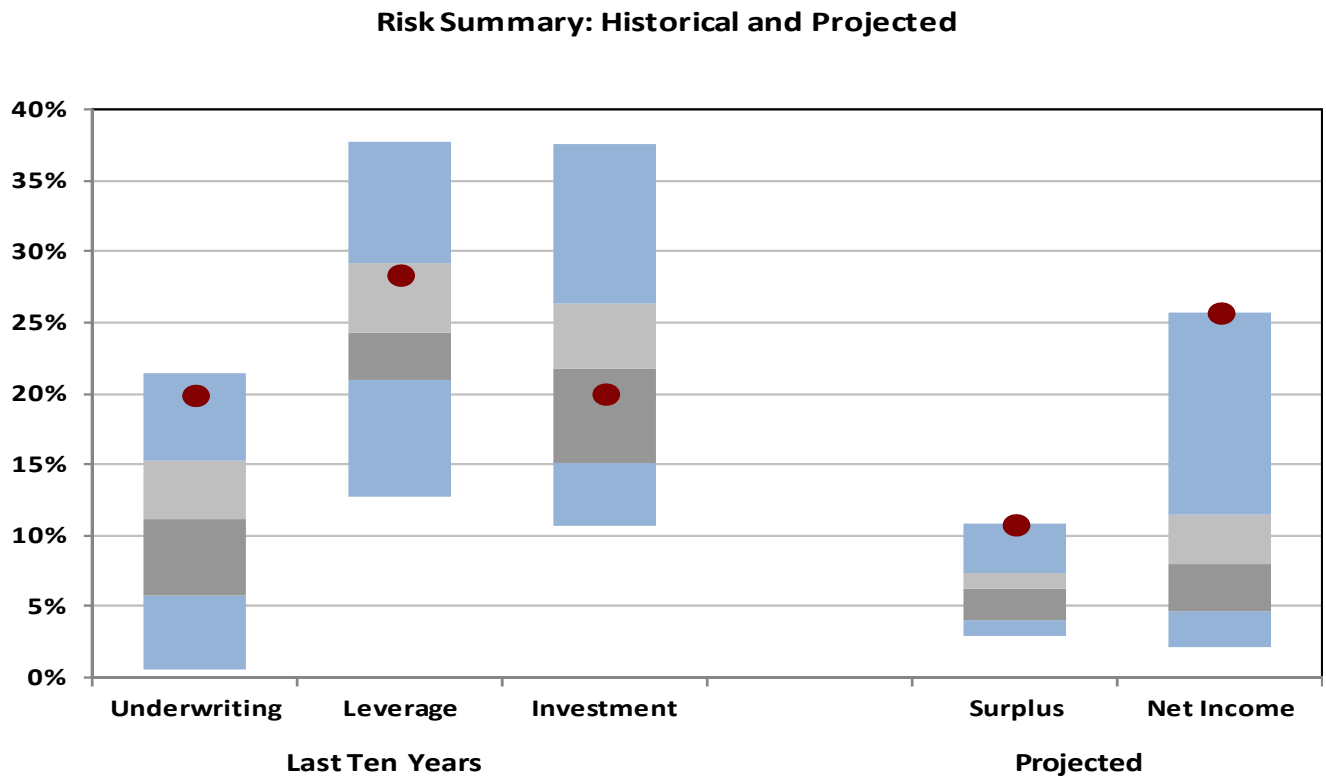
# Cumulative Net Income: Risk vs. Return




This chart shows the tradeoff between net income risk (the probability of negative three-year cumulative net income) and return (expected cumulative net income as a percent of surplus).

Sample Company's net income risk return posture is greater risk and greater expected return than its peer company median.

# Summary




Relative to its peer companies, Sample Company has:

1. High underwriting risk; and
2. Above median leverage.
3. Slightly below median investment risk, with good diversification;

These combine to:

1. High expected surplus growth, with high risk; and
2. High expected net income, with high risk.

# CLIENT DFA ANALYSIS

# Simulation Assumptions

## Capital Market

| Asset Class | Expected Return | Risk | Sharpe Ratio |
|---|---|---|---|
| Cash | 0.5 | 1.0 | NA |
| Bonds | 4.0 | 6.0 | 0.58 |
| High Yield | 6.0 | 14.0 | 0.39 |
| Large Cap Stocks | 8.0 | 21.0 | 0.36 |
| Int'l Stocks | 8.0 | 24.0 | 0.31 |
| Small Cap Stocks | 9.0 | 24.0 | 0.35 |
| Emerging Markets | 10.0 | 34.0 | 0.28 |

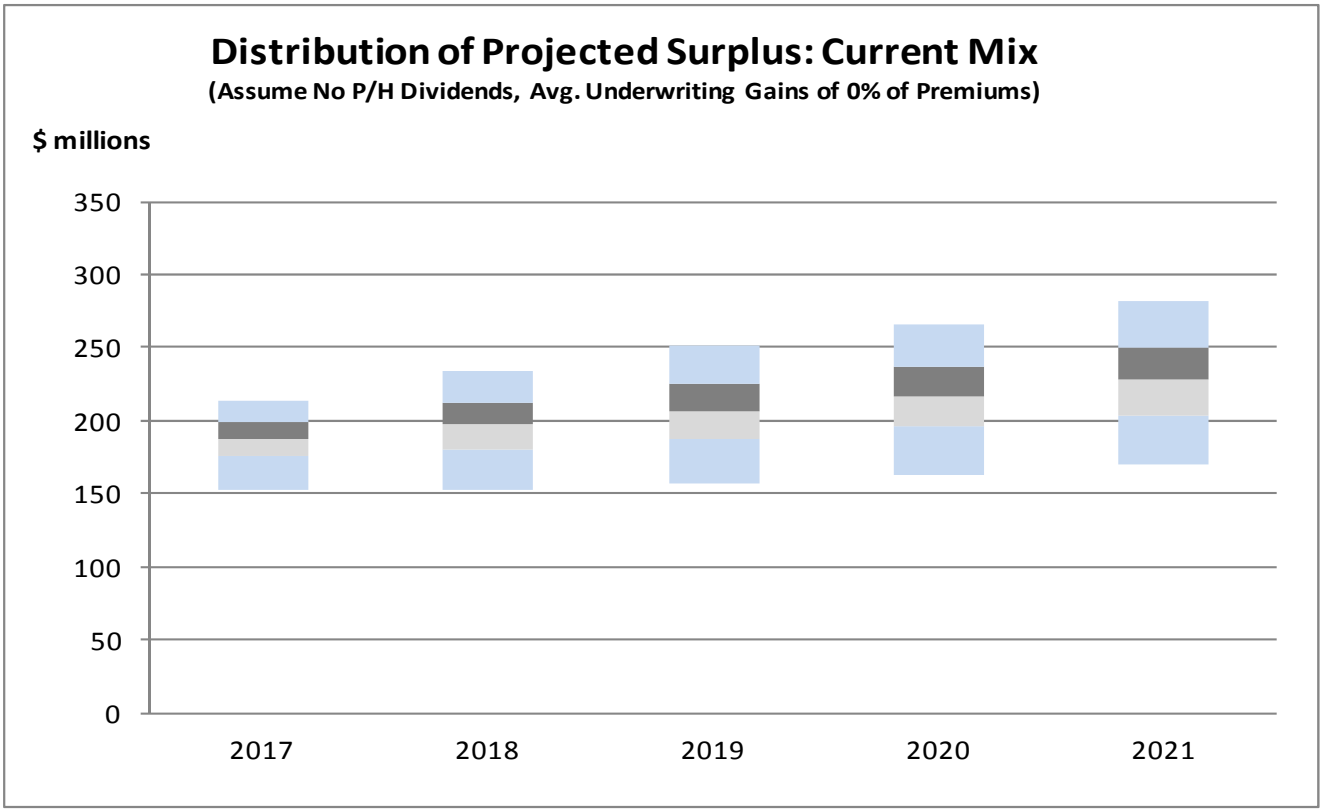
## Liability

| | Mean | Std. Dev. |
|---|---|---|
| **Premium Growth Rates** | 0.0 | 6.2 |
| **Underwriting Gains as a percent of premiums** | 0.0 | 19.9 |

| | 2016 |
|---|---|
| **Premiums** | 50,000 |
| **Invested Assets** | 391,000 |
| **Surplus** | 178,000 |

# Projected Surplus Growth

Assuming No P/H Dividends and Average Underwriting Gains of 0% of Premiums



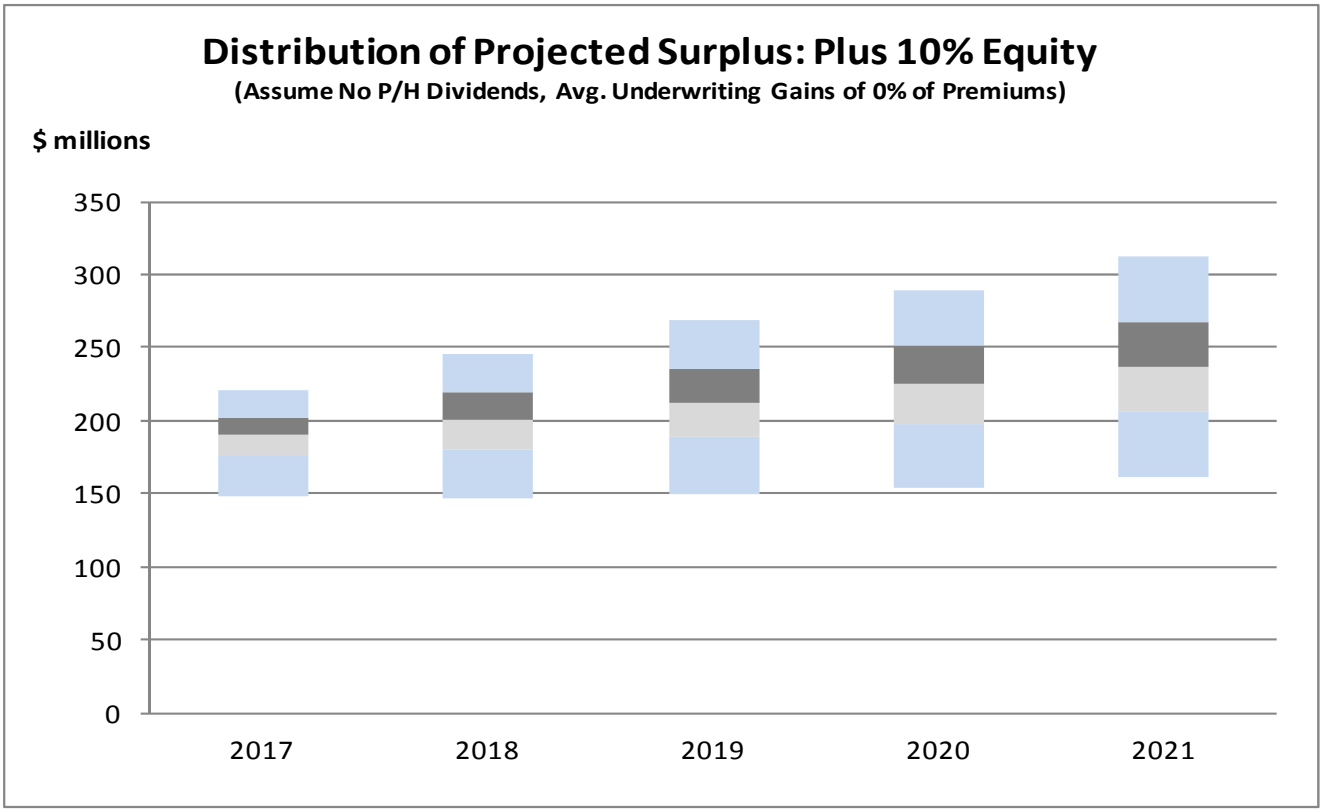

## Distribution of Projected Surplus: Current Mix

(Assumes No P/H Dividends, Dollars in Millions)

| Percentile | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| 5th | 214 | 234 | 252 | 266 | 282 |
| 25th | 199 | 213 | 225 | 238 | 250 |
| **50th** | **188** | **197** | **207** | **217** | **227** |
| 75th | 176 | 180 | 188 | 196 | 204 |
| 95th | 153 | 153 | 157 | 163 | 170 |

# Projected Surplus Growth

Assuming No P/H Dividends and Average Underwriting Gains of 0% of Premiums



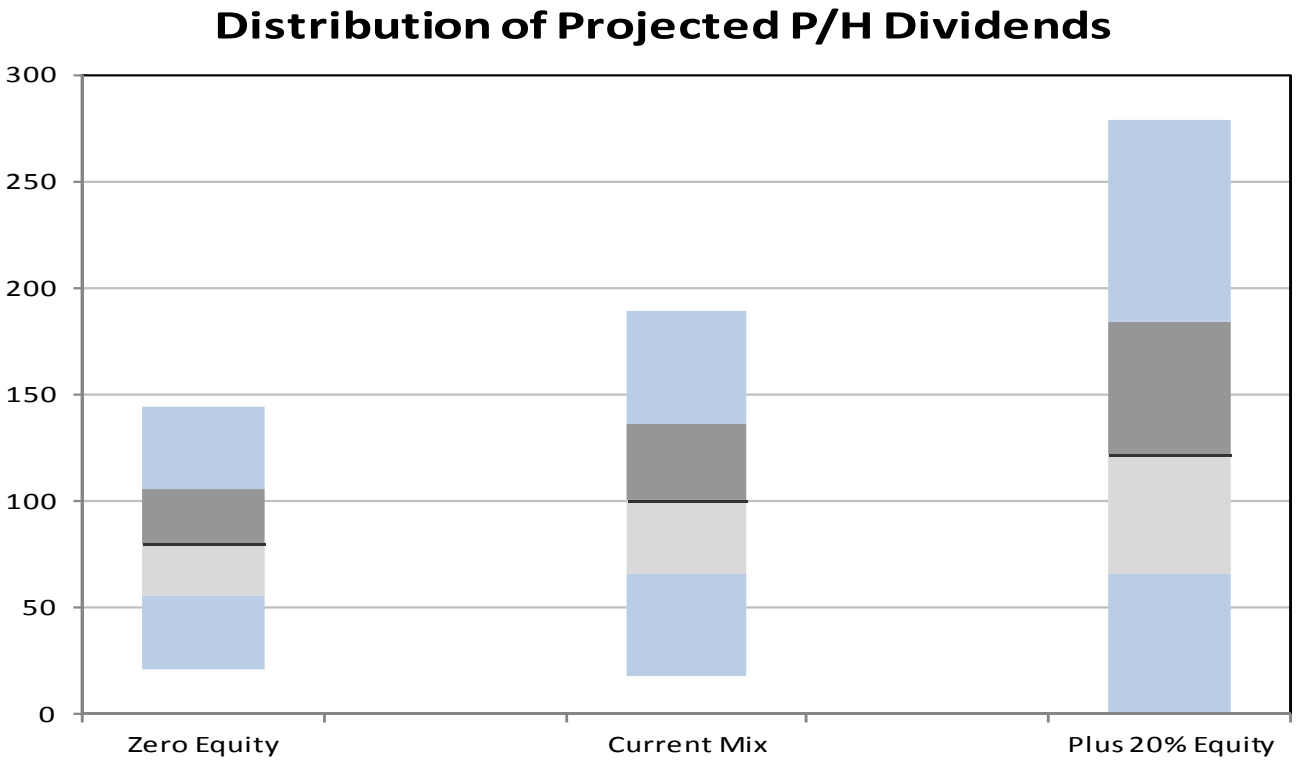

## Distribution of Projected Surplus: Plus 10% Equity

(Assumes No P/H Dividends, Dollars in Millions)

| Percentile | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| 5th | 221 | 246 | 269 | 289 | 312 |
| 25th | 202 | 220 | 235 | 252 | 268 |
| **50th** | **190** | **201** | **213** | **225** | **237** |
| 75th | 176 | 180 | 188 | 197 | 206 |
| 95th | 148 | 147 | 149 | 155 | 161 |

# Projected Five-Year Cumulative P/H Dividends

Assuming Constant Surplus and Average Underwriting Gains of 0% of Premiums




## Distribution of Projected P/H Dividends

(Assumes Constant Surplus, Avg. Underwriting Gains of 0% of Premiums)

| Percentile | Zero Equity | Current Mix | Plus 20% Equity |
|---|---|---|---|
| 5th | 144 | 189 | 279 |
| 25th | 106 | 136 | 184 |
| **50th** | **79** | **100** | **125** |
| 75th | 56 | 66 | 66 |
| 95th | 21 | 18 | 0 |

# Appendix

# THE DFA METHOD & APPROACH

*Dynamic Financial Analysis (DFA)* - is a stochastic simulation methodology (also called Monte Carlo Simulation) which quantifies multiple forms of risk by simulating company financial results thousands of times for each asset mix, so that all potential outcomes associated with individual asset mixes can be considered in advance. The analysis embodies a complete insurance company financial model, and considers all of the interrelationships between the asset and liability sides of the business (see overview of the process, following page). The model provides both an expected value and a distribution of possible values for each of the parameters evaluated. This approach allows us to quantify and determine the relationships among the multiple dimensions of risk that should be evaluated: asset risk, underwriting risk, reinsurance risk and business risk.

The value of this approach is that it takes into account all of the variables which affect the financial results of the company. By simulating investment, underwriting and premium growth results we are able to assign probabilities and provide ranges of probable outcomes given changes in the variables. This provides decision makers with an analysis that evaluates the interrelationship among all the various risks that the company faces, rather than simply considering investment risk in isolation. The analysis offers an integrated perspective of risks, rather than the classic financial analysis in which different aspects of the company were considered in isolation from each other. Specifically, DFA models the reactions of the company in response to a large number of interrelated risk factors including both underwriting risks – detailed by lines of business, as well as asset risks.

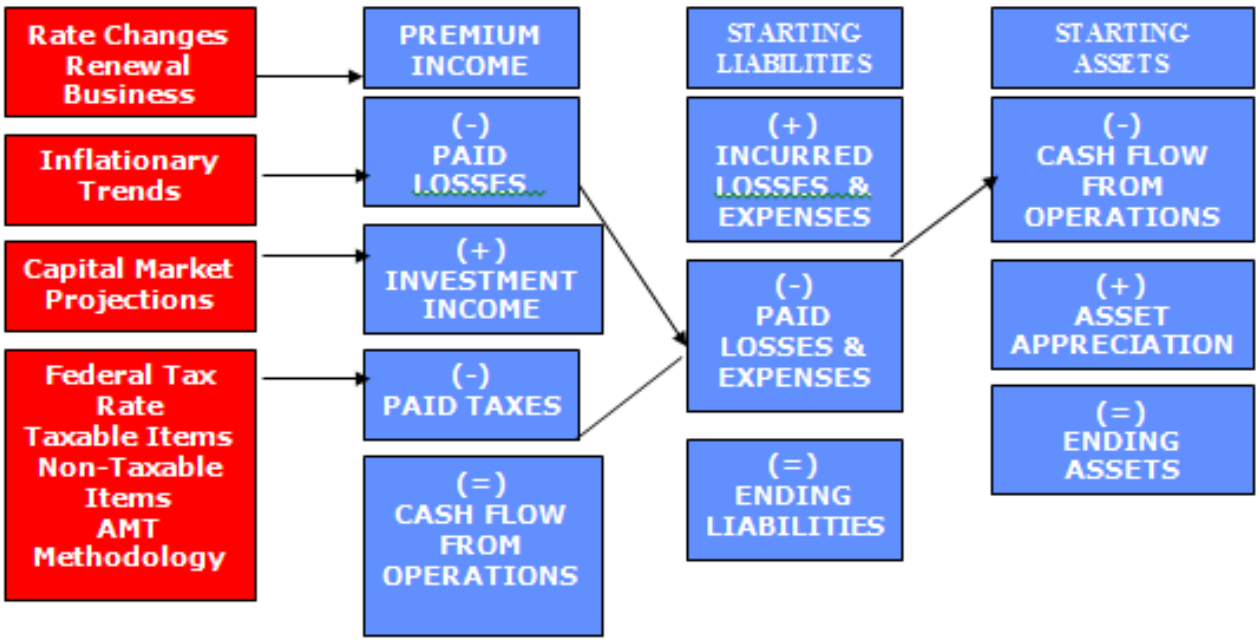
*DFA PEER RISK MODEL* - DFA Peer Risk review reflects the full financial structure of the Client Company and client peer companies, including the impact of accounting and tax structures which allow projections to be made for the balance sheet and for the profit-and-loss account of each company.

Capital market assumptions (risk, return, yield, duration and correlation) for individual asset classes and for inflation are based on a combination of Capital Market Theory, historical relationships across asset classes, and current market conditions. Liability assumptions for premium growth, loss ratios, reserve payout patterns and reinsurance strategy by line of business are based on historical results. We can also incorporate client capital market and/or liability assumptions.

The client will gain an understanding of how its investment risk and liability risk impact the range of future surplus and net income levels – and how each its various risks compare to peer companies. Finally, the client will be able to communicate a clear and objective rationale for its investment policy, both in absolute and relative terms.

## OVERVIEW OF THE NEW DFA PEER PROCESS

Our DFA analysis uses Monte Carlo Simulation to evaluate the expected behavior of various asset mixes in the context of projected assets and liabilities. To achieve this, a model of the operational cash flow, income statement and balance sheet is constructed. This model allows us to project all of the key variants, and determine their sensitivities to changes in future economic conditions. By simulating thousands of future capital market outcomes and observing the interaction of assets and liabilities across all of these potential scenarios, we can begin to understand the effect that each asset mix might have on the company's future operating results. Selected assumptions used to drive this process are outlined in the schematic below. This process is completed not only for your company, but also your peers providing useful insights into overall firm risk capacity and range of outcomes compared to peers. This DFA peer review provides invaluable insights into your competitors range of outcomes related to yours. This knowledge should lead to superior investment and risk strategies.



**ABW/Peer Analytics Risk Analytics**

# U.S. Equity Statistical Risk Model Reference

## 1 Overview

ABW Peer Analytics Risk and Skill Analytics rest on the foundation of our Equity Risk Models.

Equity risk models define current portfolio risks by modeling (regressing in the case of statistical risk models) individual security returns against underlying risk factors. For the typical stock, risk factors explain about half the security's risk, the remaining risk is security-specific. But when combined in a portfolio, most security-specific risk is diversified away; and passively available risk factors explain almost 99% of absolute return and two-thirds of incremental return for the typical portfolio.

Equity risk models can be complex and hard to interpret. Fortunately, though these models are easily tested.

To evaluate the predictive accuracy of an equity risk model, we compare returns predicted by past factor exposures to subsequent portfolio performance: We calculate *factor exposures* using estimated holdings at the end of each month and predict the following month's returns using these *ex-ante* factor exposures and *ex-post* factor returns.

The correlation between predicted and actual returns measures a model's accuracy. The higher the correlation, the more effective a model is at *hedging*, stress testing and scenario analysis, as well as evaluating *investment* risk and *skill*.

Clients need not rely on the out-of-sample testing we've done; we can provide passive ETF alternative portfolios for any of your managers and you can evaluate our models' accuracy over subsequent months.

The ABW Peer Analytics' models solve practical problems encountered by asset owners beyond the scope of generally available products. We tested thousands of hedge and mutual fund portfolios over decades of history to sharpen our models, eliminating important shortcomings that plague existing systems. Among the critical flaws of statistical (time-series) equity risk models addressed are the following:

- Collinearity among Market, Industry/Sector, and Style factors – Dependence among factors leads to misleading covariance matrix estimate and flawed performance attribution.[12]
- Incomplete coverage of systematic risk – Traditional factors fail to account for most of the systematic risk of certain portfolios.
- Macro inconsistency – Popular approach to weighting securities using square-root of market capitalization leads to flawed performance attribution for passive market and sector portfolios.

# 2 Model Construction

## 2.1 Factors

The U.S. Equity Statistical Risk Model (the Model) captures systematic risk using the following factors:

- Market – Aggregate equity market performance
- Sectors – Equity performance specific to the following sectors:
  - Consumer
  - Energy Minerals
  - Finance
  - Health
  - Industrial
  - Miscellaneous
  - Non-Energy Minerals
  - Technology
  - Utilities
- Bonds – Return for the Barclays US Aggregate Government Bond Index
- Oil – Change in the crude oil price
- FX – Return for the United States Dollar Index
- Size – Equity performance specific to company size. The capitalization-weighted performance of the top decile of residual equity returns minus that of the bottom decile, ranked by their market capitalizations.
- Value – Equity performance specific to company valuation. The capitalization-weighted performance of the top decile of residual equity returns minus that of the bottom decile, ranked by their book value to price ratios.
- Statistical Factors (Stat Factors) – Returns for linearly uncorrelated variables that explain the largest possible variance of portfolio securities not captured by the above factors. Stat Factors identify observable systematic risks not explicitly named by the model.
  - StatFactor1 – The first statistical factor
  - StatFactor2 – The second statistical factor
  - StatFactor3 – The third statistical factor

## 2.2 Fitting Linear Models

Factor exposures are estimated by robust regression using the M estimator. Fitting is done by iterated re-weighted least squares (IWLS) using the Huber psi function.[3456]

Observations are exponentially weighted with 0.02 monthly decay. Observation weight is reduced by approximately half after 36 months.

## 2.3 Factor Return and Exposure Estimation

The Model estimates factor returns and factor exposures hierarchically. Residuals from the precious regression step are used to estimate factor returns and exposures in the following step, thus avoiding the collinearity problems that plague most commercial statistical risk models:

- Market
  - Estimate the Market return as the capitalization-weighted return of index securities.
  - Fit linear models to estimate market exposures: SecurityReturns ~ MarketReturn.
  - Save residuals as MarketResiduals for the following step.
- Sectors
  - Estimate Sector factor returns as capitalization-weighted returns of index securities' MarketResiduals.
  - Fit linear models to estimate Sector exposures: MarketResiduals ~ SectorReturn.
  - Save residuals as SectorResiduals for the following step.
- Bonds, Oil, and FX
  - Fit linear models to estimate Bonds, Oil, and FX exposures: SectorResiduals ~ BondsReturn + OilReturn + FXReturn.
  - Save residuals as BondsOilFXResiduals for the following step.
- Size, Value
  - Estimate Size factor returns as capitalization-weighted returns of the top decile minus the bottom decile of index securities' BondsOilFXResiduals, ranked by their capitalization.
  - Estimate Value factor returns as capitalization-weighted returns of the top decile minus the bottom decile of index securities' BondsOilFXResiduals, ranked by their Book to Price ratios.
  - Fit linear models to estimate Size and Value exposures: BondsOilFXResiduals ~ SizeReturn + ValueReturn.
  - Save residuals as SizeValueResiduals for the following step.
- Statistical Factors
  - Statistical factors are estimated on each portfolio's SizeValueResiduals.
  - Perform maximum-likelihood factor analysis on the portfolio's SizeValueResiduals matrix, estimating three dominant Stat Factors.[7]
  - Fit linear models to estimate the exposures of all securities to the Stat Factors: SizeValueResiduals ~ StatFactor1 + StatFactor2 + StatFactor3