# MEASUREMENT OF REMOVAL OF UNCOMPENSATED RISK IN THE PORTFOLIOS OF FIVE CALIFORNIA COUNTY PUBLIC EMPLOYEE PENSION PLANS

Year Ending September 30, 2016

Fresno County
Imperial County
Mendocino County
Merced County
Tulare County


Complete Paper: http://www.precisionfiduciary.com/5county

## CONCLUSION
## DON'T LEAVE MONEY ON THE TABLE

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# Executive Summary

Precision Fiduciary Analytics has completed a study of the retirement plans of 5 California counties (Fresno, Imperial, Mendocino, Merced, and Tulare) to determine if they are prudently managing investment risk. Following is a summary of the study's findings and our recommendations to remediate the issues the study uncovered.

Findings:

1. None of the portfolios studied had an adequate number of assets for its size to be reasonably diversified. A sufficiently large number of securities must be held in the portfolio to allow enough shrinkage leeway to accommodate minimum concentration requirements as defined by the portfolio's concentration coefficient.

2. None of the portfolios studied had a high enough concentration coefficient score to be classified as sufficiently un-concentrated to be considered reasonably diversified.

3. None of the portfolios studied generated enough Fama-Booth Diversification Return (FBDR) to be considered "Reasonably" diversified.

4. In all 5 of the portfolios studied, none reduced levels of uncompensated risk by more than 20%, causing 80% or more of uncompensated risk to remain in the portfolio.

5. The consistency of findings in all 5 of the county plans studied confirms the answer to the question raised by the title of our recent White Paper that more than 90% of the public pension plan trustees could be in breach.

Recommendations:

1. All 37 public pension plans adopt a procedural process to monitor and manage uncompensated risk.

2. All 37 plans have about $750 Billion under management. One bps (1/100 of 1%) would be a savings of $75 Million; 10 bps would mean $750 Million. We believe there would be an improvement of at least 50% in bps for the 5 studied county plans with the possibility of 3 attaining more bps, possibility as much as 100.

3. CalPERS & CalSTRS and the 5 counties lead the way by installing a procedural process to monitor and manage uncompensated risk.

4. Governor and Legislators focus on pension plans that have been actuarially forecasted to have less than 60% of their pension liabilities covered, and install a procedural process to monitor and manage uncompensated risk.

5. We previously recommended to the State Controller's Office (SCO) that they proceed to install a timely, quarterly, digital investment system for all public pension plans in California. It is feasible!

6. We previously recommended to the California State Board of Accountancy (CBA), and we will recommend to the Government Standards Accountancy Board (GASB), that any pension plan falling below 60% funding of their pension liabilities be a subject of discussion in the annual audit's Management Letter. Furthermore, in cases where any plan does not have a procedural process for monitoring and managing uncompensated risk, Management Letter discussion should also be required as part of the annual audit.

## THE BOTTOM LINE

This unconstrained optimization is presented to help you understand what's at stake. It gives you an idea of **HOW BADLY IN BREACH OF YOUR FIDUCIARY DUTY TO DIVERSIFY YOU ARE & HOW MUCH MONEY YOU ARE LEAVING ON THE TABLE** as a result.

The answer to both questions rests within the range of lost diversification "alpha" resulting from your board's failure to prudently diversify.

The lower end of the range is estimated as the differences between the Fama Booth BPS of each county's Arbitrary Reasonably Conservative Portfolio less its Actual Portfolio, multiplied by the total portfolio value at September 30, 2016.

The upper end of the range is estimated as the differences between the Fama Booth BPS from the Maximum UCR Reduction Portfolio less the Fama Booth BPS from each county's Actual Portfolio, multiplied by each county's total portfolio value at September 30, 2016.

| County Retirement Boards | Range of Lost Diversification "Alpha" | |
|---|---|---|
| | Lower End | Upper End |
| Fresno | $ 7.8 Million | $ 44.3 Million |
| Imperial | $ 2.6 Million | $ 8.5 Million |
| Mendocino | $ 1.6 Million | $ 4.7 Million |
| Merced | $ 2.9 Million | $ 7.8 Million |
| Tulare | $ 5.2 Million | $ 14.1 Million |

The Upper End values approximate maximum annual losses in added return that plaintiffs could claim as damages in a successful breach of fiduciary duty lawsuit, while the Lower End values approximate minimum annual losses that could reasonably be defended as damages. As a retirement plan fiduciary, each board member has joint and several liability with his/her fellow board members. And due to the SCOUS's 2015, 9-0 decision in *Tibble vs. Edison International,* there is no statute of limitations protection to restrict the number of years annual damages can be assessed.

# MEASUREMENT OF REMOVAL OF UNCOMPENSATED RISK

## Why We Prepared This Report

This assessment of Uncompensated Investment Risk (UCR) removal is meant to be motivating, inspiring and to encourage public pension plan trustees to prudently and reasonably reduce UCR. **UCR monitoring has been required by the statutes for almost 25 years but has been ignored because the universal use of Big Math was not available until recently**. Now we have the tools to convert UCR to compensated risk (CR) to gain Diversification Alpha. This is especially important during this critical period of lower actuarial discount rates being adapted and some potential for deterioration in the current 8-year bull market in equities. Unfunded liability issues in some plans also are unnerving.

Additionally, we have recommended to the State's Controller's Office (SCO) to set up a digital, quarterly reporting system that gives all California public retirement defined benefit plans timely, comparative investment performance and risk analysis within six weeks of the end of each quarter. This timely information would assist the staff, advisers, consultants and fiduciaries (the individual board members in particular) with evaluating, on a real time basis, where they stand compared to other similar plans as we travel through what might be difficult times. Obviously, it also puts the pressure on staff and advisors to do the best they can under circumstances they face with the least volatility lowest drawdowns etc., while utilizing *a prudent procedural process to reduce **uncompensated*** risk as is required by trust and fiduciary laws. This report could influence the value of such a timely reporting system.

## Why Did We Do This Assessment Pro Bono?
## Why 5 Small County Pension Plans?

This preliminary assessment is being done pro bono publico by us, Precision Fiduciary Analytics. Our company mission is the reduction of UCR assets in portfolios and to gain diversification alpha in the process through assistance to staff, advisers, consultants, and the trustees. This is our vested interest and we thought it appropriate to do an in-depth analysis.

We found during our extensive research of California public retirement plans for our recent White Paper that the larger the plan, the more complicated were the vast portfolio components. We could not complete such a task on a pro bono basis, and this was especially the case for CalPERS and CalSTRS. We did do a preliminary assessment for the $12.5 billion SDCERA in 2015 that had transparent and financially-detailed information on their web site (see agenda 2. Items 3 and 3.1). We also knew that the smaller plans were much more apt to have enough information on their web sites so we could do a preliminary assessment of their UCR removal. As a result, we started from the bottom up in size within the 37 entities we reviewed in our White Paper. We eliminated the entities that did not have enough transparency to avoid any need to contact them for further clarification. We ended up choosing the first five that did have acceptable financial transparency: Fresno $4.104 billion portfolio, Imperial $714 million portfolio, Mendocino $444 million portfolio, Merced $691 million portfolio, and Tulare $1.176 billion portfolio — a total of $7.13 Billion as of September 30, 2016.

## Why Hasn't the Industry Been Evaluating and Reducing UCR?

From the inception of Modern Portfolio Theory, many academics have taken the time and effort to measure how much UCR can be eliminated when constructing a portfolio. However, the academic standard for UCR measurement required the portfolio be built entirely of equally weighted (to overcome weighting bias) and randomly selected (to overcome selection bias) constituents.

As a result, real-world portfolios built for maximized risk-adjusted returns (compensated risk), cannot accommodate those rigid constraints, so industry practice *focused on managing compensated risk* through asset allocation while ignoring management of UCR, even though it has been part of fiduciary law for almost 25 years.

Industry practice defaulted to adding a sufficient number of somewhat un-correlated "investments" to a portfolio. While causing some portfolio UCR to be reduced, that practice created other new UCR. The reasons for this apparent anomaly are that academics investigated UCR in the context of constructing an entire portfolio, whereas practitioners must diversify to eliminate UCR from a pre-existing asset allocated portfolio. The old academic approach to UCR assessment could not be asymmetrical until the arrival of **BIG MATH**.

## Uncompensated (Investment) Risk Defined

Uncompensated Investment Risk (UCR) is a risk that can be eliminated with diversification, and unlike systematic or compensated risk, investors cannot expect added return for assuming more UCR. UCR comes from the inherent diversification risk of a concentration of investments in a particular industry or sectors, individual firms and, other investment factors at the portfolio level. It also results from holding too many assets that are closely correlated to one another. Uncompensated risk represents approximately 2/3 of total risk.[1]

## The Restatement of Trust Law 3rd

The Restatement of Trust Law 3rd, American Law Institute, 1992. Volume 8 Section 227 addresses the General Standard of Prudent Investment:

"The duty of caution does not call for avoidance of risk by trustees but for their prudent management of risk." (pg. 18)

"In understanding a trustee's duties with respect to the management of risk, it is useful to distinguish between diversifiable (or "uncompensated") risk and market (or non-diversifiable) risk that is, in effect, compensated through pricing in the marketplace." (pg. 19)

"The trustee's duties and objectives with respect to non-diversifiable (compensated) risk are not as distinct as those with respect to diversifiable (uncompensated) risk." (pg.19)

**"Failure to diversify on a reasonable basis in order to reduce uncompensated risk is ordinarily a violation of both the duty of caution and the duties of care and skill."** (pg. 23)

[1] The source of the estimate of 2/3 of risk attributable to uncompensated risk, and 1/3 of risk attributable to compensated risk comes from Yale Law School Legal Scholarship Repository John H. Langbein, *THE UNIFORM PRUDENT INVESTOR ACT AND THE FUTURE OF TRUST INVESTING*, 1-1-1996, page 646-7. They cite Brealy at the bottom of page 647 who estimated 69% and 31% We have rounded it to 2/3 and 1/3.

# What Measurements Do We Use to Find and Evaluate UCR?

Diversification measurement has two basic inputs: the relationship of each asset to every other asset in the portfolio, as measured by their cross-correlations, and the utility function for every asset, as measured by the relative attractiveness of each asset. These asset variables are used to quantify the diversification alpha at both the security and asset class level and form the basis for UCR elimination.

We use **Diversification Dimensions (DD)** to reduce UCR, a proprietary protocol that calculates and measures the absolute equivalent number of equally weighted diversification resources in a portfolio. Each DD has the ability to move independently within a portfolio's structure — the larger the number of independently moving elements in a portfolio, the broader the portfolio's diversification and elimination of UCR.

**Tracking Error to Asset Allocation** is the metric used to define the delta between the performance of the portfolio being examined and the performances in the Asset Allocation Portfolio. Within limits, small amounts of tracking error are acceptable in UCR elimination monitoring. Larger tracking errors can cause material errors in interpreting UCR measurements even when other measurements appear normal. Accordingly, knowing the tracking error metric is an integral part of a prudent UCR investigation.

**Active Risk (stated as % of Variance)** is the segment of risk present in an investment portfolio which is greater than the risk (return) caused by the market forces, aka market risk. The difference between market risk and portfolio risk is measured as a percentage of variance. Where both beta and $R^2$ of the portfolio being studied exceed 0.90 and the tracking error registers zero %, then we can assume the portfolio's risk and return is attributable entirely to market factors (systematic or compensated risk) and not to non-market factors (NCR).

**Weighted Cross-Correlation %** is a stand-alone, holistic metric that measures the composition of all interrelationships, including their respective weightings of a given portfolio. It quantifies the degree to which the securities held inside the portfolio are expected to move in the same direction and is an academically-accepted measure of the systematic risk present in the portfolio.

**Cross-Correlation %** is the companion metric to the Weighted Cross Correlation %. It too is a stand-alone, holistic metric. But it only measures the composition of all interrelationships (without weighting them) inside a given portfolio. It is used in conjunction with the Weighted Cross Correlation % to identify the extent to which weighting influences diversification. Nearly identical percentages indicate that weighting exercised little or no impact on diversification. The greater the divergence between percentages, the greater the impact weightings have on diversification.

**Total Number of Portfolio Holdings** is simply the numerical count of the number of securities held in the portfolio.

**Concentration Coefficient (CC)** is a measure of a portfolio's concentration and is equal to the number of assets if equally weighted. Equal weighting is an essential ingredient of UCR measurement. Since most portfolios are constructed with unequal weightings, it is imperative to be able to convert the actual number of portfolio holdings into their equivalent number of

equally-weighted holdings. CC is used in combination with other diversification metrics to quantify uncompensated risk removed from a portfolio by diversification. Higher CC values indicate more uncompensated risk removed through diversification.

**Fama-Booth Total Diversification Returns**: In Diversification Returns and Asset Contributions, Fama and Booth (1992) explained how diversification yielded additive portfolio returns, naming the phenomenon "diversification returns." They reasoned that if the correlation of all a portfolio's assets were 1, then the weighted average asset variance would equal the portfolio variance. They went on to prove how more diversification increased this incremental return, and was a function of the amount of variance reduction and not the actual level of portfolio variance. They estimated a portfolio's "diversification returns" equaled half the variance reduction caused by diversification. For example, if you start with a portfolio made up entirely of low-volatility assets, their covariance can only reduce the portfolio's standard deviation by a small amount — causing smaller variance reduction and reduced "diversification returns." Prudent UCR management requires focusing on correlations, not standard deviations.

**Fama-Booth UCR Diversification Return**: Recognizing that "diversification returns" applies to both market and idiosyncratic risk, the market factors are subtracted from the totals to determine the UCR portion of the Fama-Booth "diversification return." The risk attributable to market factors is defined by the Asset Allocation Portfolio.

## Our Method of Analysis

We compiled and calculated various accepted measures of UCR elimination from each county portfolio based on the portfolio as it stood on September 30, 2016. Then we applied the same analysis of UCR elimination to four synthetic constructed benchmarks based on their standings at September 30, 2016. The following assumptions and modifications were made:

1. Both the number of shares and their closing prices were fixed as of September 30, 2016.
2. All computations were made based on the assumptions that the number of shares owned on September 30, 2016 remained identical throughout the 1-year period beginning on September 30, 2015.
3. Any splits or share dividends were adjusted.
4. Cash dividends were reinvested.
5. Compounded returns were used for comparison purposes in this report instead of GIPS, which is the usual CFA standard for reporting returns and for that reason is used in quarterly Investment Performance Reporting by Versus Callan.
6. **YOUR ACTUAL ONE YEAR RETURN WILL NOT COMPARE WITH OUR CALCULATED RETURN BECAUSE**:
   A) Of (5) above,
   B) The assumption of no change in the portfolio for the entire year,
   C) Our use of proxies for some Private REITs, Private Equities and other Alternative Investments, and
   D) Any risk-parity strategy with derivatives.

# Comparative Results of Our Analysis

Appendix - A (pages 10 – 20) contains a detailed analysis of each county's UCR. Data is presented in two types of graphs with accompanying tables, a bar graph and a scatter graph. The bar graph and table have 3 columns of data identified as "A", "B", and "C", while the scatter graph and table have 5 columns of data identified as "1", "2", "A", "B", and "C".

Table - I (page 7) presents the data, sorted by country, from columns "B" and "C", in a side by side format designed to assist the reader in gaining a better understanding of UCR differences.

COLUMN 1 is the FTSE Global Equity Index (FTSE) is a cap-weighted all world equity index covering 47 different countries and includes approximately 7,400 individual securities. It encompasses every equity and sector available to worldwide investing. This index is used throughout the report as the benchmark for the "total market portfolio".

COLUMN 2 is the Macro Allocation, an artificial portfolio consisting of two holdings that bring risk and risk reduction assets together in proportions identical to those of the Actual County Portfolio on September 30, 2016. The FTSE Global Equity Index is the proxy used for the risk portion and US cash is the proxy used for the risk reduction portion.

COLUMN A is the Asset Allocation portfolio, an artificial portfolio consisting of the Actual Portfolio's major asset classes in the identical proportions as they existed on September 30, 2016. The proxies used for each category were: Domestic Equity VTI, Foreign Equity VEU, Alternatives PEX, Real Estate VNQ and Fixed Income & Cash BNDS & SHV.

COLUMN B. The Actual Portfolio (AP) is the portfolio being studied for UCR removal. It consists of all the individual positions held in the portfolio on September 30, 2016, and in the same proportions. In certain instances, where ticker symbols were not available for a particular holding, we assigned a proxy symbol related to that asset which may generally assign characteristics but is one of the reasons this assessment is preliminary. If a thorough assessment were made later we would expect to have the investment consultant provide a more accurate proxy. As previously mentioned this proxy is a partial explanation of the difference between each plan's actual reported yearly return and our calculation based on our assumptions.

COLUMN C. The Arbitrary "Reasonable" Portfolio is a simulated portfolio constructed by PFA to illustrate a simple innocent diversification solution to "Reasonably" increasing diversification by removing UCR while maintaining the portfolio's asset optimization, and thereby following the edicts of Sec 227, Restatement 3rd of Trusts. The portfolio consists of 65 individual ETFs and mutual funds, 10 of which are equally weighted bond funds within the risk reduction category of the portfolio's asset allocation. One ETF is a money market fund, uniquely allocated in the exact amount needed to complete the allocation to the portfolio's risk reduction asset category. The remaining 54 ETFs and mutual funds are equally weighted and divided among the various asset classes as follows: 42 domestic equity in 10 sectors, 8 foreign equity, and 4 REITs.

Appendix - B (pages 21-22) is a scatter graph that looks similar to those in Appendix A. While column headings "1", '2", and "A" are nominally the same as in Appendix A, unlike Appendix A where asset allocation weightings are based on September 30, 2016 values, in Appendix B all asset allocation weightings are based on October 1, 2015 values. The beginning of the year weightings and values give us a more accurate reflection of how the portfolios would have performed in real time.

> COLUMN D is Precision Fiduciary Analytics' MAX UCR REDUCTION PORTFOLIO (MAX-UCR-RP). It is designed to illustrate the impact of what maximized UCR reduction and gains in diversification returns can accomplish at the portfolio level using only security statistics available on October 1, 2015. Accordingly, the portfolio's asset allocation was set at 70% risk assets and 30% risk reduction assets as of October 1, 2015, otherwise no other constraints were imposed.

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The answer to both questions rests within the range of lost diversification "alpha" resulting from your board's failure to prudently diversify.

The lower end of the range is estimated as the differences between the Fama Booth BPS of each county's Arbitrary Reasonably Conservative Portfolio less its Actual Portfolio, multiplied by the total portfolio value at September 30, 2016.

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| County Retirement Boards | Range of Lost Diversification "Alpha" | |
|---|---|---|
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The Upper End values approximate maximum annual losses in added return that plaintiffs could claim as damages in a successful breach of fiduciary duty lawsuit, while the Lower End values approximate minimum annual losses that could reasonably be defended as damages. As a retirement plan fiduciary, each board member has joint and several liability with his/her fellow board members. And due to the SCOUS's 2015, 9-0 decision in Tibble vs. Edison International, there is no statute of limitations protection to restrict the number of years annual damages can be assessed.

# COMPARATIVE RISK - RETURN ANALYSIS BY COUNTY
## ACTUAL PORTFOLIO (COLUMNS B) & "REASONABLE" PORTFOLIO (COLUMNS C)
## TRAILING 1-YEAR ENDED, SEPT 30, 2016

| Portfolio | FRESNO CERA 60/40 | | IMPERIAL CERA 64/36 | | MENDOCINO CERA 77/23 | | MERCED CERA 73/27 | | TULARE CERA 71/29 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Actual Portfolio | Arbitrary Reasonably Conservative Portfolio | Actual Portfolio | Arbitrary Reasonably Conservative Portfolio | Actual Portfolio | Arbitrary Reasonably Conservative Portfolio | Actual Portfolio | Arbitrary Reasonably Conservative Portfolio | Actual Portfolio | Arbitrary Reasonably Conservative Portfolio |
| **Asset Allocation Data** | | | | | | | | | | |
| Domestic Equity | *20.4%* | *46.8%* | *31.9%* | *49.9%* | *38.2%* | *59.8%* | *30.2%* | 57.0% | *25.5%* | *57.8%* |
| International Equity | *18.9%* | *8.9%* | *25.2%* | *9.5%* | *28.3%* | *11.4%* | *24.6%* | 10.9% | *25.6%* | *7.9%* |
| Real Estate | *8.1%* | *4.5%* | *4.7%* | *4.8%* | *10.5%* | *5.7%* | *8.3%* | *5.4%* | *6.2%* | *5.26%* |
| Alternatives | *12.7%* | - | *2.4%* | - | - | - | *10.2%* | - | *13.7%* | - |
| Fixed Income & Cash | *39.8%* | *39.8%* | *35.8%* | *35.8%* | *23.1%* | *23.1%* | 26.7% | 26.7% | *29.1%* | *29.1%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | | | | | | |
| ROR ** | 10.28% | 11.76% | 10.58% | 12.45% | 8.87% | 13.86% | 9.21% | 13.49% | 7.87% | 13.25% |
| Standard Deviation | 9.83% | 9.11% | 9.79% | 9.71% | 11.83% | 11.61% | 10.12% | 11.07% | 9.33% | 10.72% |
| Sharpe Ratio | 0.8585 | 1.1569 | 0.9831 | 1.1863 | 0.7441 | 1.1437 | 0.7555 | 1.1558 | 0.9264 | 1.1785 |
| Maximum Drawdown | -10.35% | -10.26% | -9.72% | -9.51% | -13.83% | -11.52% | -10.46% | -10.94% | -10.30% | -10.58% |
| Largest 1-Day Loss | -3.51% | -2.10% | -3.12% | -2.25% | -4.50% | -2.79% | -3.59% | -2.63% | -3.22% | -2.54% |
| **Portfolio Metrics** | | | | | | | | | | |
| Correlation | 0.98 | 0.97 | 0.99 | 0.97 | 0.97 | 0.98 | 0.99 | 0.97 | 0.99 | 0.96 |
| R-Squared | 0.96 | 0.95 | 0.99 | 0.95 | 0.95 | 0.95 | 0.98 | 0.95 | 0.97 | 0.92 |
| Portfolio Beta to Risk Assets | *0.71 | 0.64 | 0.62 | 0.59 | 0.76 | 0.72 | 0.69 | 0.68 | *0.59 | 0.66 |
| Portfolio Beta to Asset Allocation Portfolio | *1.19 | 1.06 | 1.01 | 0.96 | 1.00 | 0.97 | 0.96 | 1.02 | *0.86 | 0.96 |
| **Uncompensated Risk Measurements** | | | | | | | | | | |
| Tracking Error to Asset Allocation Portfolio | 0.16% | 0.14% | 0.16% | 0.15% | 0.17% | 0.17% | 0.16% | 0.16% | 0.15% | 0.19% |
| Active Risk (stated as % of Variance) | 4.50% | 5.29% | 1.15% | 5.73% | 5.17% | 5.28% | 2.25% | 5.47% | 3.67% | 7.97% |
| Weighted Cross Correlation % | 58% | 62% | 64% | 64% | 70% | 66% | 70% | 67% | 68% | 65% |
| Cross Correlation % | 69% | 69% | 66% | 69% | 77% | 69% | 73% | 69% | 68% | 69% |
| Total Number of Holdings | 26 | 65 | 17 | 65 | 24 | 65 | 26 | 65 | 28 | 65 |
| Concentration Coefficient (CC) | 21 | 49 | 5 | 54 | 16 | 56 | 17 | 56 | 18 | 59 |
| Fama-Booth Total Diversification Return | 0.32% | 0.51% | 0.21% | 0.57% | 0.34% | 0.70% | 0.27% | 0.69% | 0.21% | 0.65% |
| Fama-Booth UCR Diversification Return | 0.10% | 0.30% | 0.01% | 0.37% | 0.14% | 0.49% | 0.05% | 0.47% | -0.04% | 0.39% |

* Two beta calculations of each portfolio were performed, the beta of the entire Asset Allocation Portfolio and the beta of the risk portion only. The results from each of the calculations are expected to resemble 1.00 and a value close to the portfolio's asset allocation, respectively. The beta results for 3 portfolios were exactly as anticipated, however, results for 2 portfolios, Fresno and Tulare were not. The causes for the beta disruptions appear to be portfolio tilts in favor of investment factors, other than beta, and had little or no impact on UCR outcomes or conclusions.

** Annual rates of return will not agree with those reported in quarterly Investment Performance Reporting. Please see page 3, item number 6 above, for a complete explanation of the differences.

# Findings

1. None of the portfolios studied has an adequate number of assets for its size to be reasonably diversified. A sufficiently large number of securities must be held in the portfolio to allow enough shrinkage leeway to accommodate minimum CC levels. Based on the rule of thumb discussed below, a reasonable diversified portfolio with desperate weightings requires about 100 securities. (Note – The PFA Reasonable Portfolio with its 65 equally-weighted risk holdings is able to surpass minimum CC requirements due to equal weighting.)

2. None of the portfolios studied had a sufficient number of equally weighted equivalent securities for its size to be considered reasonably diversified. A good rule of thumb is a reasonably diversified portfolio should have a CC of 30, defined as the total number of equivalent equally weighted securities at the portfolio level. As an example, the 500 securities in the S&P 500 have a CC of 134.

3. None of the portfolios studied generated enough Fama-Booth Diversification Return (FBDR) to be considered "Reasonably" diversified. The medium used for UCR measurement was basis points (BPS) of FBDR. Based on our experience, a minimum FBDR score of 50 is deemed adequate.

4. None of the portfolios studied had more than 20% of their total UCR eliminated by diversification. Based on our experience, we estimate each one of PFA's "Reasonable" portfolios has diversified away 2/3 of total UCR. The 100% marker is established by dividing "Reasonable" portfolio's FBDR by 0.67.

# Recommendations – Public Pension Plans and Regulatory Agencies

One of our findings was that all 5 counties do not have a procedural process to prudently and reasonably monitor and manage UCR. **We recommend they adapt a procedural process to monitor and manage Uncompensated Risk**.

1. Our recent White Paper included the research on 37 California public defined benefit plans estimated that at that time the 37 represented over 95% of all state public plans with combined portfolios of ¾ of a Trillion Dollars. As part of this study we looked at all 37 Investment Policy Statements (IPS) and in only one, Sonoma County, did they mention UCR. However, in a telephone conversation with the Sonoma executive officer it was determined that there was no procedural process in existence except for the short paragraph in their IPS recognizing UCR. It can be assumed, as we suggested in the White Paper, that over 90% of trustees for these 37 plans could be in breach for not having a prudent and reasonable process to monitor and reduce UCR. **We recommend that all 37 plans adapt such a procedural process.**

2. As we pointed out at our presentation to CalPERS and other boards, an increase of just 1 bip (1/100 of 1%) in return for those 37 plans is equivalent to an increase of $75 Million Dollars; an increase of 10 bips equals ¾ of a Billion Dollars. CalPERS and CalSTRS make up 2/3 of this total potential. **We recommend that CalPERS and CalSTRS lead the way by adapting such a procedural process to manage UCR.** We have made such a proposal to CalPERS.

3. The Governor and Legislators should be made aware of this opportunity for The State of California to reduce its exposure to unfunded liabilities, which in some cases may be so low to question whether or not they could eventually become insolvent. **In such cases we recommend the Governor and Legislature consider those plans identified as being substantially underfunded, and through regulations require the plans so designated**

**to install a procedural process to prudently and reasonably manage UCR with the accompanying objective of gaining diversification alpha.**

4. **We recommend the State Controller's Office proceed to install a timely, quarterly, digital investment reporting system. It is feasible.** The benefits are obviously significant as is shown in this 5 county study. The goal would be to assist the public plans in fiduciary compliance and gain diversification alpha raising the average return of all public plans while narrowing the differences between the high and low return plans in the various risk reward categories (60% equities/40% Fixed Income, or 70/30, 80/20 etc.). Mr. Vernazza and Mr. Frank have previously made such a proposal to the SCO.

5. California Board of Accountancy (CBA) and Government Accounting Standards Board (GASB)

   A) The CBA last year "addressed the issue of the quality of employee benefit plan audits after receiving testimony from the Department of Labor, AICPA and National Association of CPAs. The CBA decided to concentrate efforts on an outreach program designed to inform those who perform employee benefit audits the need to be better educated in this area." (From the President's Message in the Fall 2016 UPDATE to all members/CPAs of the CBA.)

   B) Coincidently, Katrina Salazar CPA is the President of the CBA and in private/public life she is the Controller for the California Correctional Peace Officers Association. She recently received The Sacramento Business Journal non-profit CFO of the Year Award for her work with the association's defined benefit and 401K plans. She has received a copy of this 5 county analysis.

   C) Mr. Vernazza has spoken to Patti Bowers, executive officer of CBA, about presenting the case to GASB of the importance of, and fruitful results of, a procedural process for prudently and reasonably reducing Uncompensated Risk (UCR) in public pension plans. **It is also the opinion of Mr. Vernazza and Mr. Frank that auditors of public pension plans be required to issue a Management Letter if there is not procedural process in existence to monitor and manage UCR.**

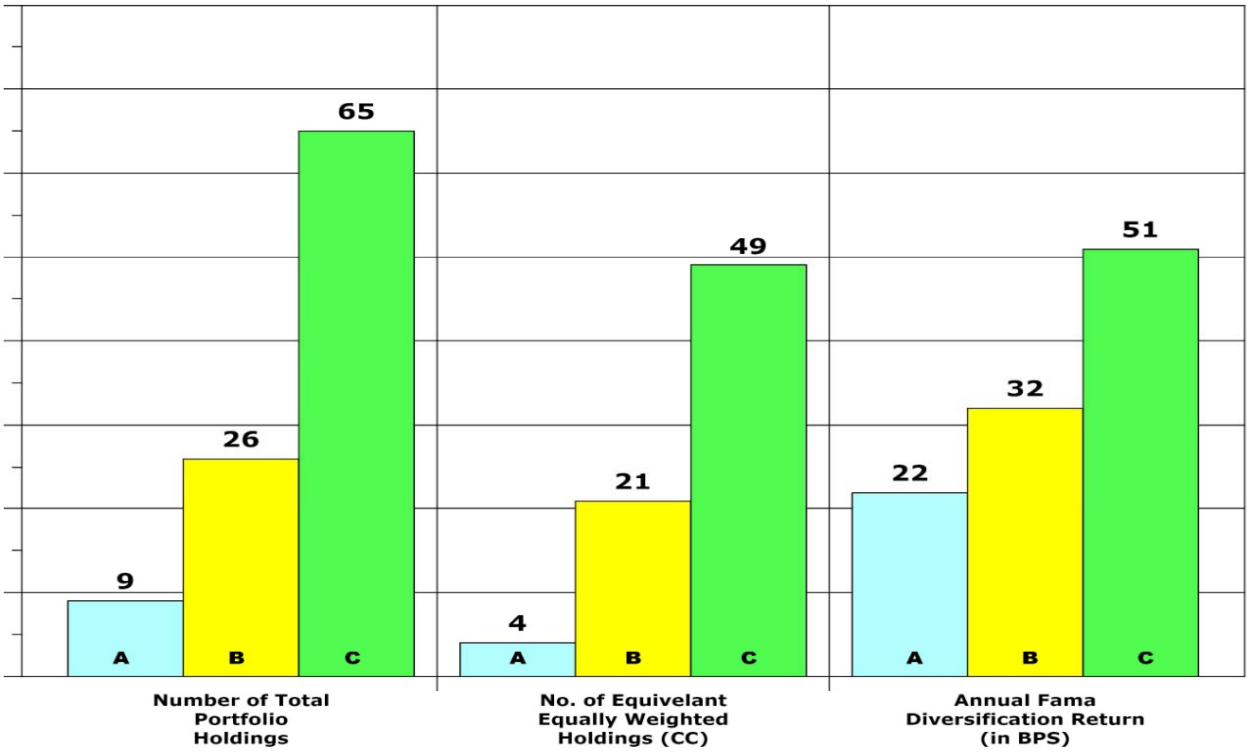
Appendix - A

# Uncompensated Risk Analyses
# &
# Comparative Risk / Return Analyses

Fresno County Employee Retirement Plan
Imperial County Employees' Retirement Plan Mendocino County Employees' Retirement Plan Merced County Employees Retirement Plan Tulare County Employees Retirement Plan

# Fresno County Retirement Plan

## *Uncompensated Risk Analysis*
## *For the 1-Year Ended September 30, 2016*



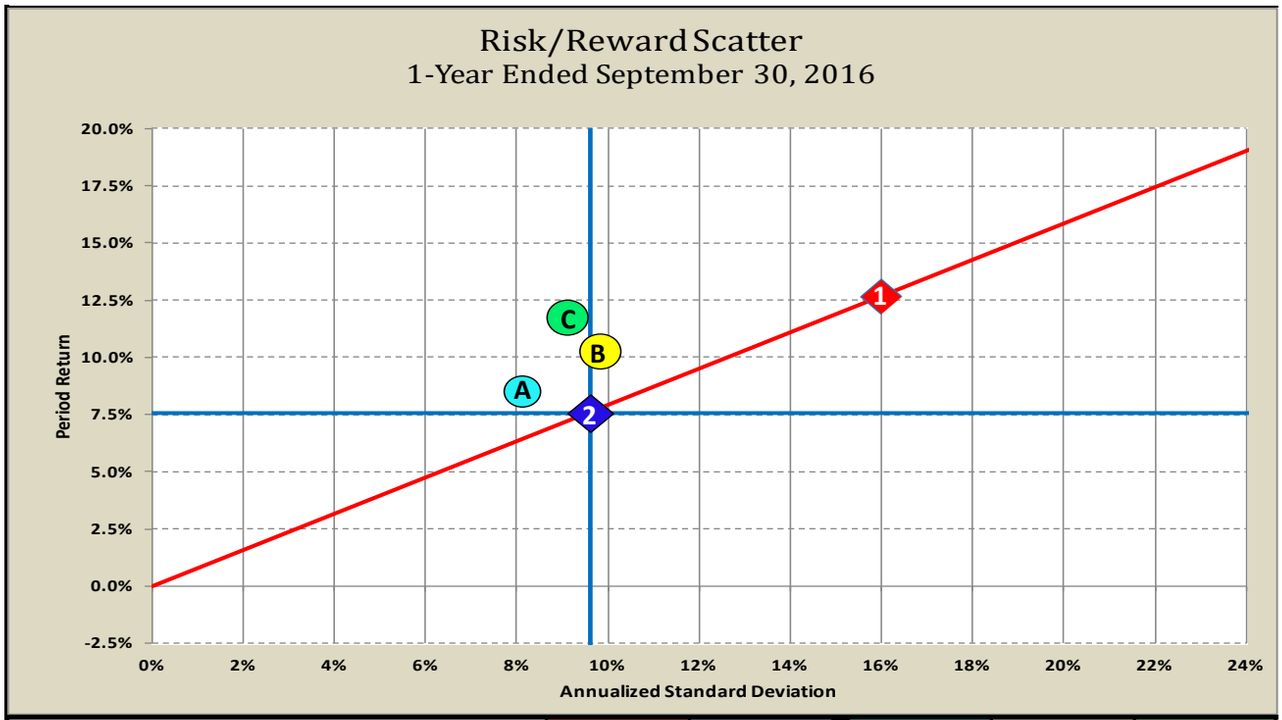

| Portfolios: | A Asset Allocation Portfolio | B Actual Portfolio | C Reason-able Portfolio |
|---|---|---|---|
| **Uncompensated Risk Measurements** | | | |
| Total Number of Portfolio Holdings | 9 | 26 | 65 |
| Concentration Coefficient (CC) | 4 | 21 | 49 |
| Fama's Diversification Return (in BPS) Metric | 22 | 32 | 51 |
| Uncompensated Risk Removed by Diversification | 0% | 10 | 30 |
| % Uncompensated Risk Removed by Diversification | 0% | 18% | 54% |
| % of Uncompensated Risk Remaining in Portfolio | 100% | 82% | 46% |

**A mathematical definition of Uncompensated Risk (UCR) is the maximum reduction in a portfolio's risk caused by an optimum combination a specified minimum number of equally-weighted constituent assets having the right combination of asymmetric correlations.**

**A portfolio having a minimum Concentration Coefficient(CC) of 30 accompanied by a Fama Diversification Return Metric (FDRM) that scores 50 or greater satisfies our criteria for a portfolio diversified on a "Reasonable" basis (the larger the FDRM score, the better the diversification).**

# Fresno County Retirement Plan

## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*

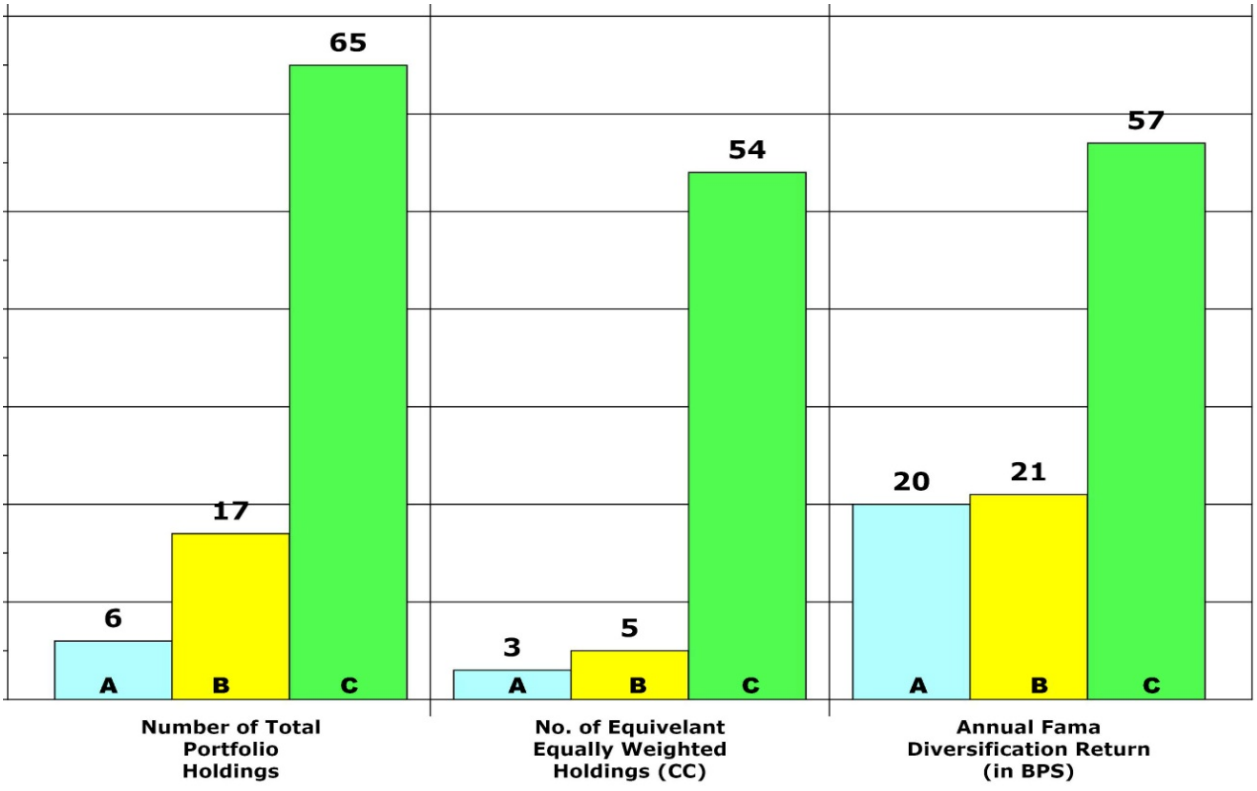



| Indices & Portfolios: | 1 FTSE ALL Cap Global Index | 2 MACRO Allocation | A Asset Allocation Portfolio | B Actual Portfolio | C Reason-able Conserve Portfolio |
|---|---|---|---|---|---|
| **Asset Allocation Data** | | | | | |
| Foreign & Domestic Equities | *100.0%* | *60.2%* | - | - | - |
| Domestic Equity | - | - | *20.4%* | *20.4%* | *46.8%* |
| International Equity | - | - | *18.9%* | *18.9%* | *8.9%* |
| Real Estate | - | - | *8.1%* | *8.1%* | *4.5%* |
| Alternatives | - | - | *12.7%* | *12.7%* | - |
| Fixed Income & Cash | - | *39.8%* | *39.8%* | *39.8%* | *39.8%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | |
| ROR | 12.65% | 7.56% | 8.53% | 10.28% | 11.76% |
| Standard Deviation | 16.01% | 9.62% | 8.12% | 9.83% | 9.11% |
| Sharpe Ratio | 0.7486 | 0.6820 | 0.7456 | 0.8585 | 1.1569 |
| Maximum Drawdown | -15.98% | -9.27% | -8.20% | -10.35% | -10.26% |
| Largest 1-Day Loss | -5.46% | -3.19% | -2.45% | -3.51% | -2.10% |
| **Portfolio Metrics** | | | | | |
| Correlation | 1.00 | 1.00 | 0.99 | 0.98 | 0.97 |
| R-Squared | 1.00 | 1.00 | 0.98 | 0.96 | 0.95 |
| Portfolio Beta to Risk Assets | 1.00 | 0.60 | 0.60 | 0.71 | 0.64 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 1.19 | 1.06 |
| **Uncompensated Risk Measurements** | | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.16% | 0.14% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 4.50% | 5.29% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 60% | 58% | 62% |
| Cross Correlation % | *N/A* | *N/A* | 71% | 69% | 69% |
| Total Number of Holdings | *N/A* | *N/A* | 9 | 26 | 65 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 4 | 21 | 49 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.22% | 0.32% | 0.51% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | 0.10% | 0.30% |

# Imperial County Retirement Plan

## *Uncompensated Risk Analysis*

## *For the 1-Year Ended September 30, 2016*



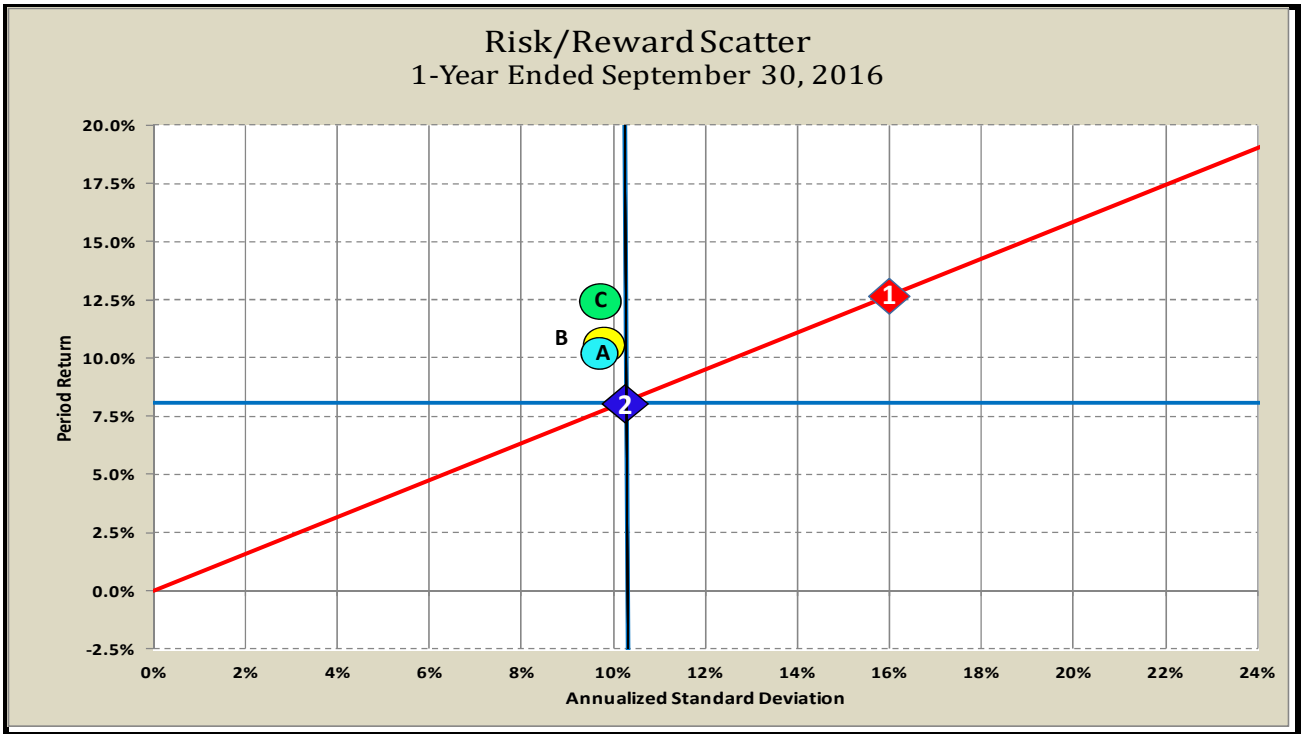

| Portfolios: | A Asset Allocation | B Actual Portfolio | C Reason-able Portfolio |
|---|---|---|---|
| **Uncompensated Risk Measurements** | | | |
| Total Number of Portfolio Holdings | 6 | 17 | 65 |
| Concentration Coefficient (CC) | 3 | 5 | 54 |
| Fama's Diversification Return (in BPS) Metric | 20 | 21 | 57 |
| Uncompensated Risk Removed by Diversification | 0% | 1 | 37 |
| % Uncompensated Risk Removed by Diversification | 0% | 1% | 56% |
| % of Uncompensated Risk Remaining in Portfolio | 100% | 99% | 44% |

**A mathematical definition of Uncompensated Risk (UCR) is the maximum reduction in a portfolio's risk caused by an optimum combination a specified minimum number of equally-weighted constituent assets having the right combination of asymmetric correlations.**

**A portfolio having a minimum Concentration Coefficient(CC) of 50 accompanied by a Fama Diversification Return Metric (FDRM) that scores 30 or greater satisfies our criteria for a portfolio diversified on a "Reasonable" basis (the larger the FDRM score, the better the diversification).**

# Imperial County Retirement Plan

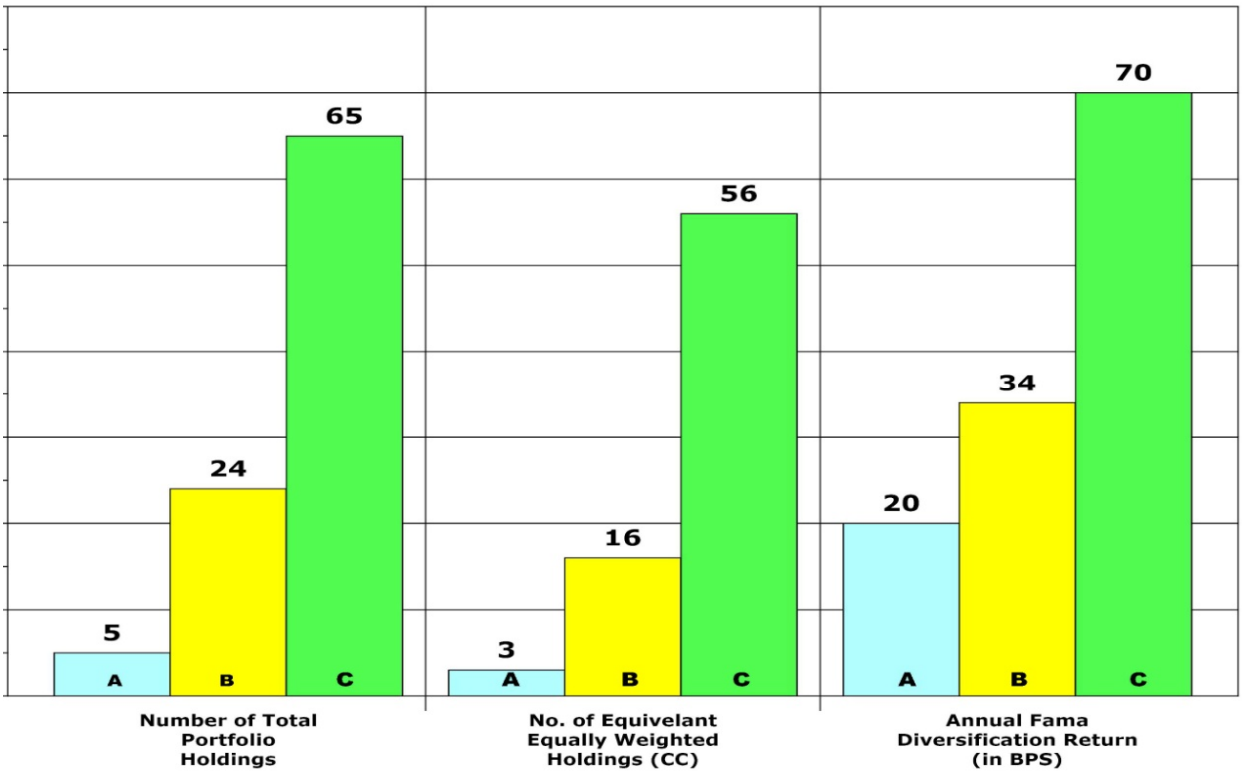
## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*




| Indices & Portfolios: | 1 FTSE ALL Cap Global Index | 2 MACRO Allocation | A Asset Allocation Portfolio | B Actual Portfolio | C Reasonable Portfolio |
|---|---|---|---|---|---|
| **Asset Allocation Data** | | | | | |
| Combined Foreign & Domestic Equities | *100.0%* | *64.2%* | - | - | - |
| Domestic Equities | - | - | *31.9%* | *31.9%* | *49.9%* |
| Foreign Equities | - | - | *25.2%* | *25.2%* | *9.5%* |
| Alternatives | - | - | *2.4%* | *2.4%* | - |
| Real Estate | - | - | *4.7%* | *4.7%* | *4.8%* |
| Fixed Income & Cash | - | *35.8%* | *35.8%* | *35.8%* | *35.8%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | |
| ROR | 12.65% | 8.05% | 10.21% | 10.58% | 12.45% |
| Standard Deviation | 16.01% | 10.25% | 9.69% | 9.79% | 9.71% |
| Sharpe Ratio | 0.7486 | 0.8405 | 0.9442 | 0.9831 | 1.1863 |
| Maximum Drawdown | -15.98% | -9.91% | -9.19% | -9.72% | -9.51% |
| Largest 1-Day Loss | -5.46% | -3.41% | -3.18% | -3.12% | -2.25% |
| **Portfolio Metrics** | | | | | |
| Correlation | 1.00 | 1.00 | 1.00 | 0.99 | 0.97 |
| R-Squared | 1.00 | 1.00 | 1.00 | 0.99 | 0.95 |
| Portfolio Beta to Risk Assets | 1.00 | 0.64 | 0.61 | 0.62 | 0.59 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 1.01 | 0.96 |
| **Uncompensated Risk Measurements** | | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.16% | 0.15% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 1.15% | 5.73% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 60% | 64% | 64% |
| Cross Correlation % | *N/A* | *N/A* | 60% | 66% | 69% |
| Total Number of Holdings | *N/A* | *N/A* | 6 | 17 | 65 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 3 | 5 | 54 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.20% | 0.21% | 0.57% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | 0.01% | 0.37% |

# Mendocino County Retirement Plan

## *Uncompensated Risk Analysis*
## *For the 1-Year Ended September 30, 2016*



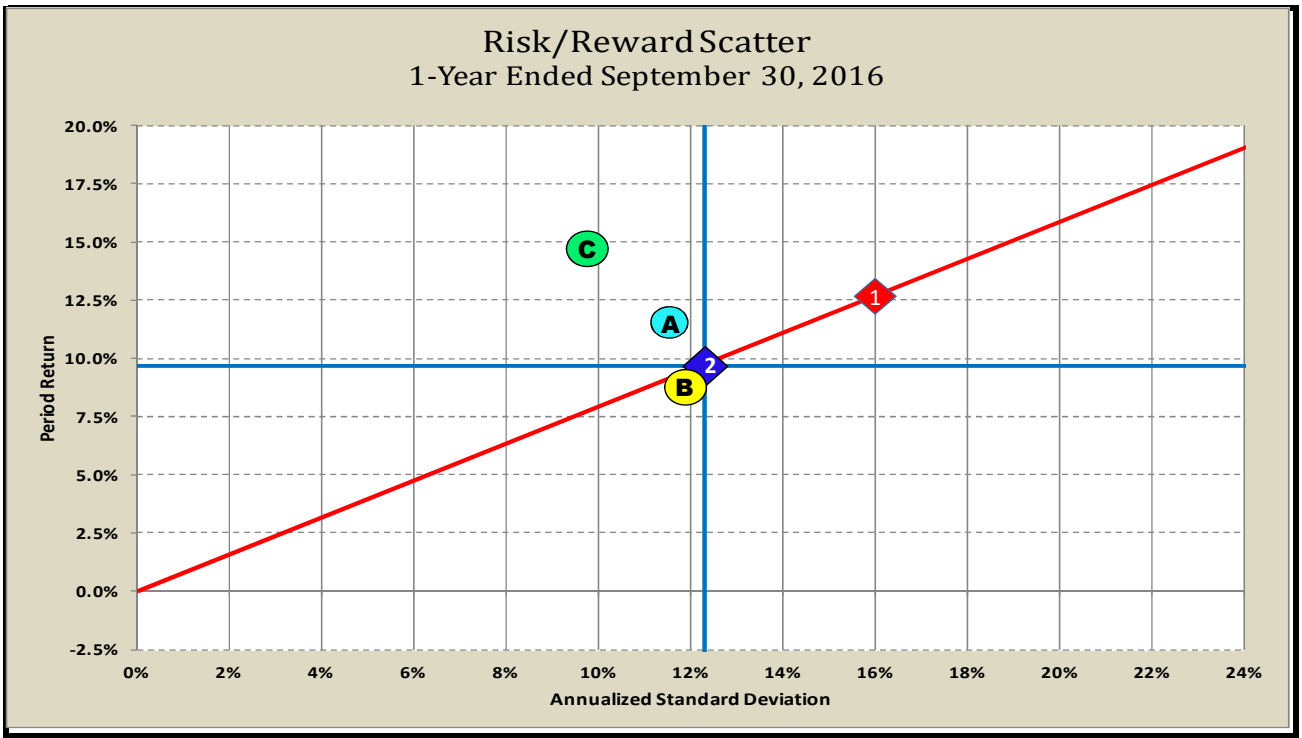

| Portfolios: | A Asset Allocation | B Actual Portfolio | C Reason-able Portfolio |
|---|---|---|---|
| **Uncompensated Risk Measurements** | | | |
| Total Number of Portfolio Holdings | 5 | 24 | 65 |
| Concentration Coefficient (CC) | 3 | 16 | 56 |
| Fama's Diversification Return (in BPS) Metric | 20 | 34 | 70 |
| Uncompensated Risk Removed by Diversification | 0 | 14 | 49 |
| % Uncompensated Risk Removed by Diversification | 0% | 16% | 59% |
| % of Uncompensated Risk Remaining in Portfolio | 100% | 84% | 41% |

**A mathematical definition of Uncompensated Risk (UCR) is the maximum reduction in a portfolio's risk caused by an optimum combination a specified minimum number of equally-weighted constituent assets having the right combination of asymmetric correlations.**

**A portfolio having a minimum Concentration Coefficient(CC) of 50 accompanied by a Fama Diversification Return Metric (FDRM) that scores 30 or greater satisfies our criteria for a portfolio diversified on a "Reasonable" basis (the larger the FDRM score, the better the diversification).**

# Mendocino County Retirement Plan

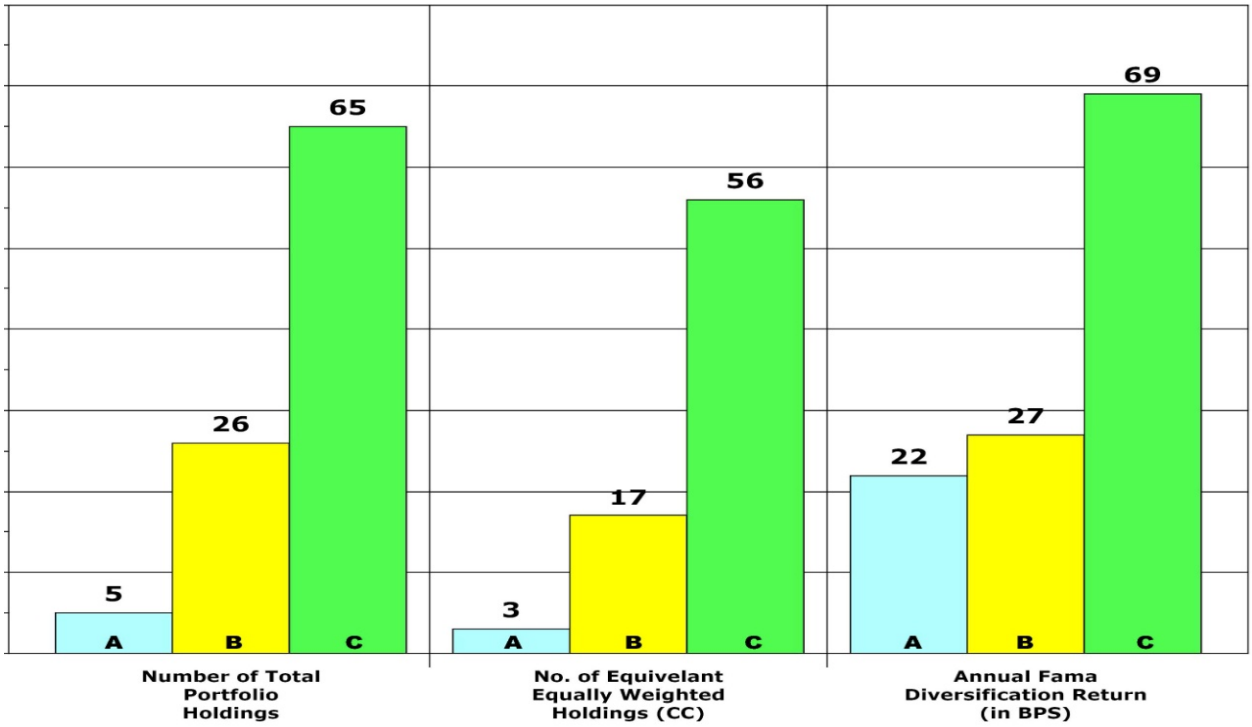
## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*




| Indices & Portfolios: | 1 FTSE All CAP Global Index | 2 Asset Allocation | A Asset Allocation | B Actual Portfolio | C Reasonable Portfolio |
|---|---|---|---|---|---|
| **Performance Metrics Table** | | | | | |
| **Asset Allocation Data** | | | | | |
| Combined Foreign & Domestic Equities | *100.0%* | *76.9%* | - | - | - |
| Domestic Equities | - | - | *38.2%* | *38.2%* | *59.8%* |
| Foreign Equities | - | - | *28.3%* | *28.3%* | *11.4%* |
| Real Estate | - | - | *10.5%* | *10.5%* | *5.7%* |
| Alternatives | - | - | - | - | - |
| Fixed Income & Cash | - | *23.1%* | *23.1%* | *23.1%* | *23.1%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | |
| ROR | 12.65% | 9.67% | 11.56% | 8.87% | 13.86% |
| Standard Deviation | 16.01% | 12.31% | 11.53% | 11.83% | 11.61% |
| Sharpe Ratio | 0.7486 | 0.7783 | 0.9122 | 0.7441 | 1.1437 |
| Maximum Drawdown | -15.98% | -12.03% | -11.12% | -13.83% | -11.52% |
| Largest 1-Day Loss | -5.46% | -4.13% | -3.59% | -4.50% | -2.79% |
| **Portfolio Metrics** | | | | | |
| Correlation | 1.00 | 1.00 | 1.00 | 0.97 | 0.98 |
| R-Squared | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 |
| Portfolio Beta to Risk Assets | 1.00 | 0.75 | 0.76 | 0.76 | 0.72 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 1.00 | 0.97 |
| **Uncompensated Risk Measurements** | | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.17% | 0.17% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 5.17% | 5.28% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 65% | 70% | 66% |
| Cross Correlation % | *N/A* | *N/A* | 58% | 77% | 69% |
| Total Number of Holdings | *N/A* | *N/A* | 5 | 24 | 65 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 3 | 16 | 56 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.20% | 0.34% | 0.70% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | 0.14% | 0.49% |

# Merced County Retirement Plan

## *Uncompensated Risk Analysis*
## *For the 1-Year Ended September 30, 2016*



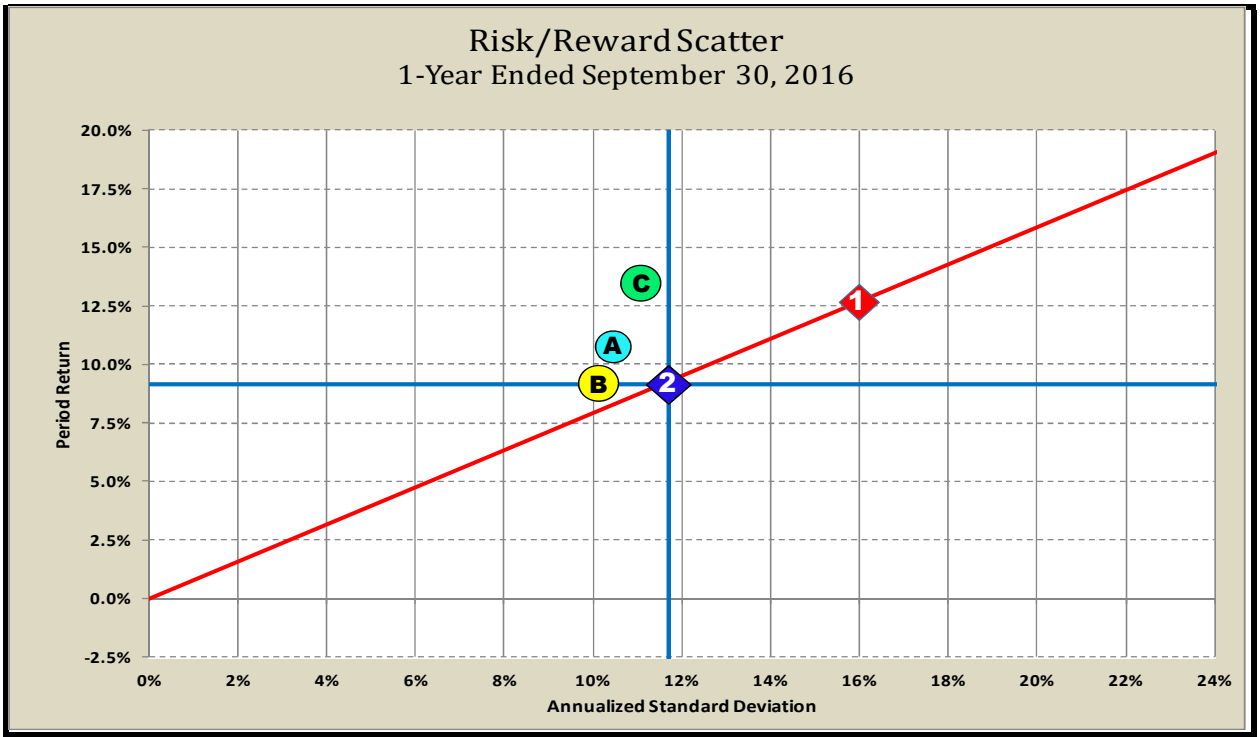

| Portfolios: | A Asset Allocation | B Actual Portfolio | C Reason-able Portfolio |
|---|---|---|---|
| **Uncompensated Risk Measurements** | | | |
| Total Number of Portfolio Holdings | 5 | 26 | 65 |
| Concentration Coefficient (CC) | 3 | 17 | 56 |
| Fama's Diversification Return (in BPS) Metric | 22 | 27 | 69 |
| Uncompensated Risk Removed by Diversification | 0 | 5 | 64 |
| % Uncompensated Risk Removed by Diversification | 0% | 6% | 78% |
| % of Uncompensated Risk Remaining in Portfolio | 100% | 94% | 22% |

**A mathematical definition of Uncompensated Risk (UCR) is the maximum reduction in a portfolio's risk caused by an optimum combination a specified minimum number of equally-weighted constituent assets having the right combination of asymmetric correlations.**

**A portfolio having a minimum Concentration Coefficient(CC) of 50 accompanied by a Fama Diversification Return Metric (FDRM) that scores 50 or greater satisfies our criteria for a portfolio diversified on a "Reasonable" basis (the larger the FDRM score, the better the diversification).**

# Merced County Retirement Plan

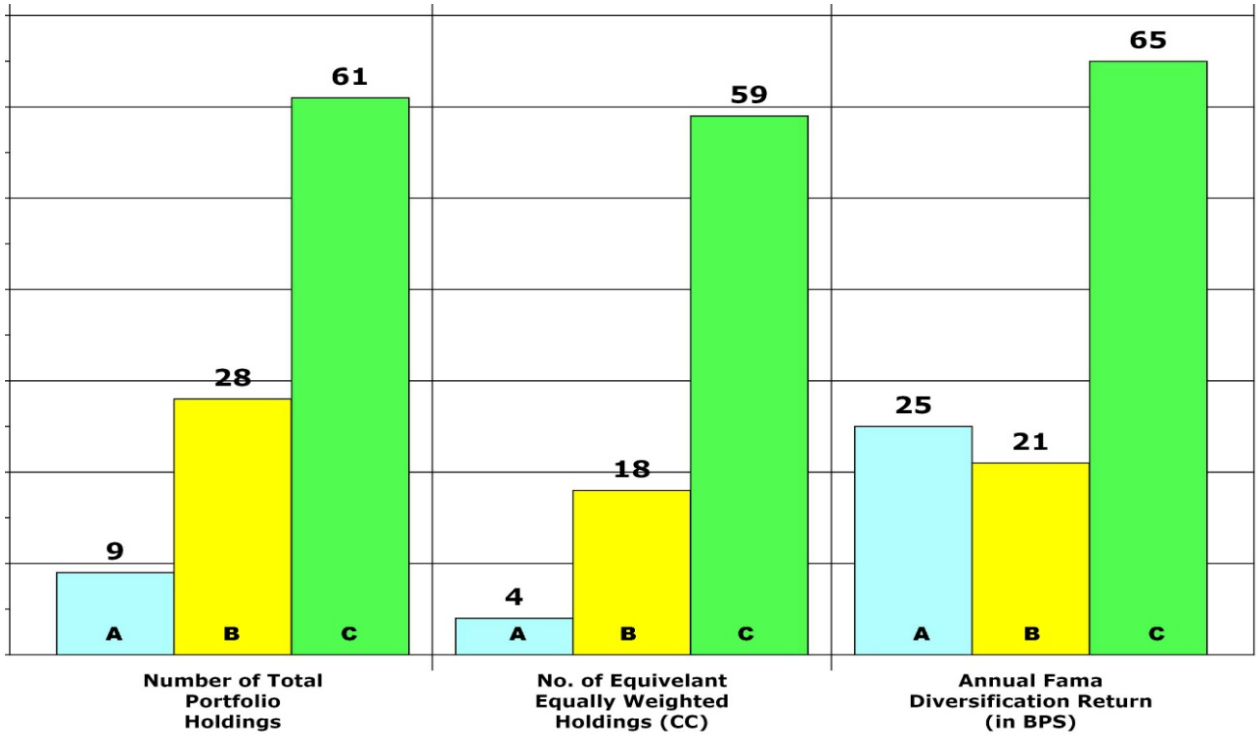
## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*




| Indices & Portfolios: | 1 FTSE All Cap Global Index | 2 MACRO Allocation | A Asset Allocation | B Actual Portfolio | C Reasonable Portfolio |
|---|---|---|---|---|---|
| **Asset Allocation Data** | | | | | |
| Combined Foreign & Domestic Equities | 100.0% | 73.3% | - | - | - |
| Domestic Equities | - | - | *30.2%* | *30.2%* | 57.0% |
| Foreign Equities | - | - | *24.6%* | *24.6%* | 10.9% |
| Real Estate | - | - | *8.3%* | *8.3%* | *5.4%* |
| Alternatives | - | - | *10.2%* | *10.2%* | - |
| Fixed Income & Cash | - | 26.7% | 26.7% | 26.7% | 26.7% |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | |
| ROR | 12.65% | 9.14% | 10.77% | 9.21% | 13.49% |
| Standard Deviation | 16.01% | 11.70% | 10.45% | 10.12% | 11.07% |
| Sharpe Ratio | 0.7486 | 0.8282 | 0.9098 | 0.7555 | 1.1558 |
| Maximum Drawdown | -15.96% | -12.03% | -10.03% | -10.46% | -10.94% |
| Largest 1-Day Loss | -5.46% | -3.92% | -3.43% | -3.59% | -2.63% |
| **Portfolio Metrics** | | | | | |
| Correlation | 1.00 | 1.00 | 1.00 | 0.99 | 0.97 |
| R-Squared | 1.00 | 1.00 | 1.00 | 0.98 | 0.95 |
| Portfolio Beta to Risk Assets | 1.00 | 1.00 | 0.71 | 0.69 | 0.68 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 0.96 | 1.02 |
| **Uncompensated Risk Measurements** | | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.16% | 0.16% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 2.25% | 5.47% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 65% | 70% | 67% |
| Cross Correlation % | *N/A* | *N/A* | 73% | 73% | 69% |
| Number of Portfolio Holdings | *N/A* | *N/A* | 8 | 26 | 65 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 3 | 17 | 56 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.22% | 0.27% | 0.69% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | 0.05% | 0.47% |

# Tulare County Retirement Plan

## *Uncompensated Risk Analysis*
## *For the 1-Year Ended September 30, 2016*



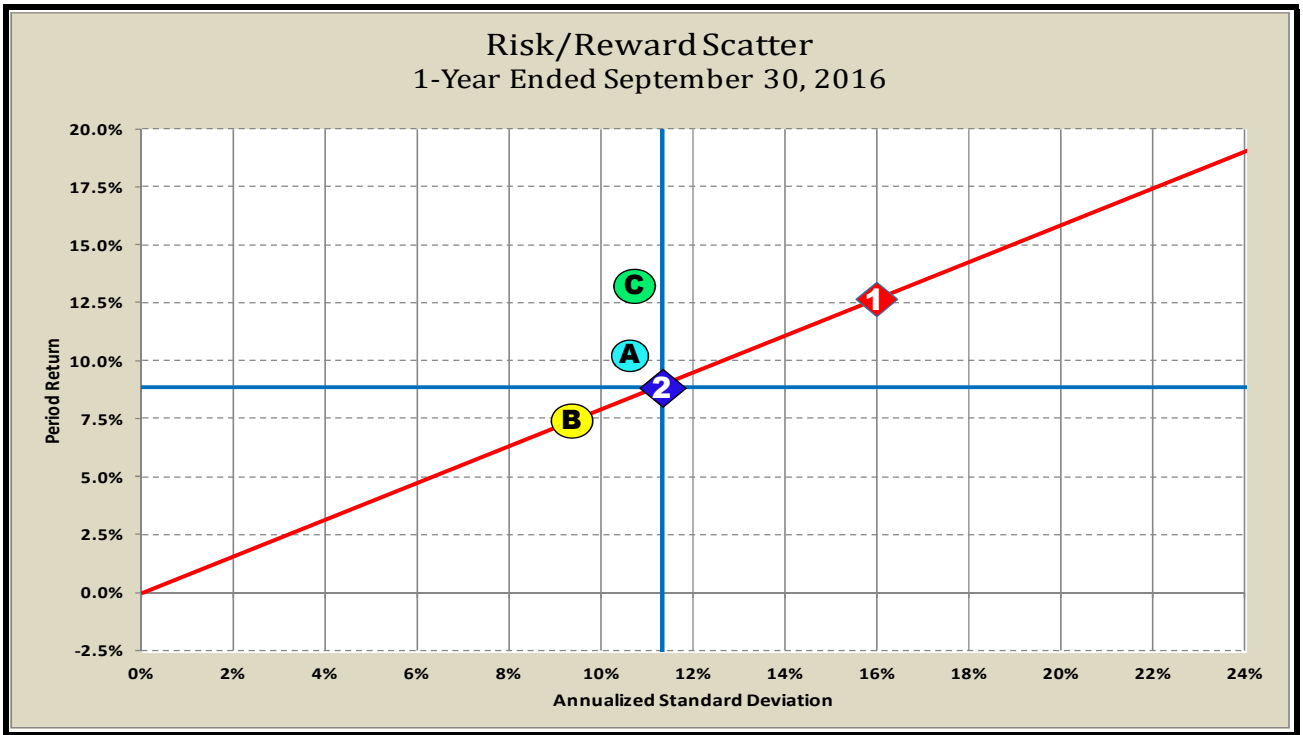

| Portfolios: | A Asset Allocation Portfolio | B Actual Portfolio | C Reasonable Portfolio |
|---|---|---|---|
| **Uncompensated Risk Measurements** | | | |
| Total Number of Portfolio Holdings | 5 | 28 | 61 |
| Concentration Coefficient (CC) | 4 | 18 | 59 |
| Fama's Diversification Return (in BPS) Metric | 25 | 21 | 65 |
| Uncompensated Risk Removed by Diversification | 0 | -4 | 39 |
| % Uncompensated Risk Removed by Diversification | 0% | -6% | 55% |
| % of Uncompensated Risk Remaining in Portfolio | 100% | 106% | 45% |

**A mathematical definition of Uncompensated Risk (UCR) is the maximum reduction in a portfolio's risk caused by an optimum combination a specified minimum number of equally-weighted constituent assets having the right combination of asymmetric correlations.**

**A portfolio having a minimum Concentration Coefficient(CC) of 30 accompanied by a Fama Diversification Return Metric (FDRM) that scores 50 or greater satisfies our criteria for a portfolio diversified on a "Reasonable" basis (the larger the FDRM score, the better the diversification).**

# Tulare County Retirement Plan

## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*




| Indices & Portfolios: | 1 FTSE ALL Cap Global Index | 2 MACRO Allocation | A Asset Allocation Portfolio | B Actual Portfolio | C Reasonable Portfolio |
|---|---|---|---|---|---|
| **Asset Allocation Data** | | | | | |
| Combined Foreign & Domestic Equities | *100.0%* | *70.9%* | - | - | - |
| Domestic Equities | - | - | *25.5%* | *25.5%* | *57.8%* |
| Foreign Equities | - | - | *25.6%* | *25.6%* | *7.9%* |
| Real Estate | - | - | *6.2%* | *6.2%* | *5.26%* |
| Alternatives | - | - | *13.7%* | *13.7%* | - |
| Fixed Income & Cash | - | *29.1%* | *29.1%* | *29.1%* | *29.1%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | | |
| ROR | 12.65% | 8.85% | 10.79% | 7.87% | 13.25% |
| Standard Deviation | 16.01% | 11.34% | 10.63% | 9.33% | 10.72% |
| Sharpe Ratio | 0.7486 | 0.7070 | 0.9113 | 0.9264 | 1.1785 |
| Maximum Drawdown | -15.98% | -11.03% | -10.39% | -10.30% | -10.58% |
| Largest 1-Day Loss | -5.46% | -3.79% | -3.87% | -3.22% | -2.54% |
| **Portfolio Metrics** | | | | | |
| Correlation | 1.00 | 1.00 | 1.00 | 0.99 | 0.96 |
| R-Squared | 1.00 | 1.00 | 1.00 | 0.97 | 0.92 |
| Portfolio Beta to Risk Assets | 1.00 | 0.69 | 0.68 | 0.59 | 0.66 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 0.86 | 0.96 |
| **Uncompensated Risk Measurements** | | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.15% | 0.19% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 3.67% | 7.97% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 60% | 68% | 65% |
| Cross Correlation % | *N/A* | *N/A* | 66% | 68% | 69% |
| Total Number of Holdings | *N/A* | *N/A* | 5 | 28 | 65 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 4 | 18 | 59 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.25% | 0.21% | 0.65% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | -0.04% | 0.39% |

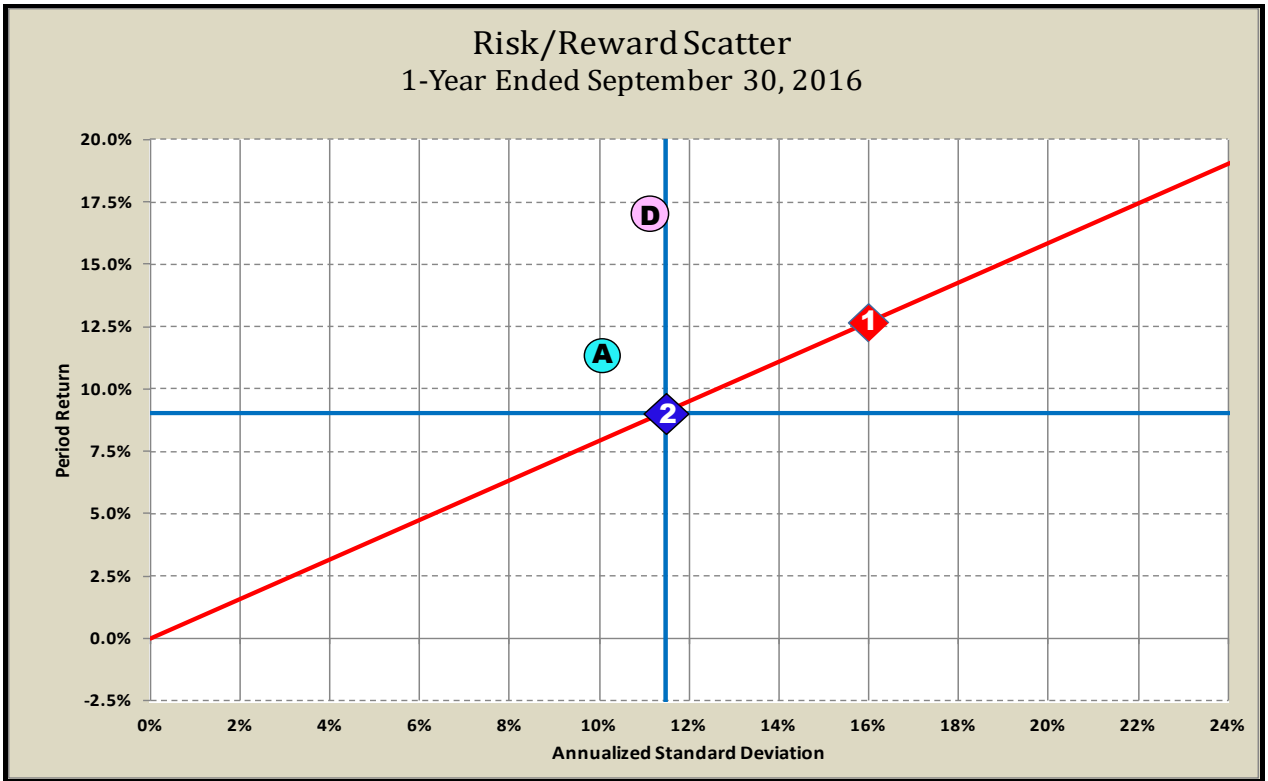
Appendix - B

Comparative Risk / Return Analysis

Maximum UCR Reduction Portfolio (MAX-UCR-RP)

# Maximum UCR Reduction Portfolio

## *Comparative Risk / Return Analysis*
## *For the 1-Year Ended September 30, 2016*




| Indices & Portfolios: | 1<br>FTSE ALL Cap Global Index | 2<br>MACRO Allocation | A<br>Asset Allocation Portfolio | D<br>MAX-UCR Reduction Portfolio |
|---|---|---|---|---|
| **Asset Allocation Data at 10/1/2015** | | | | |
| Combined Foreign & Domestic Equities | *100.0%* | *70.0%* | *70.0%* | *70.0%* |
| Fixed Income & Cash | - | *30.0%* | *30.0%* | *30.0%* |
| *TOTALS* | *100.0%* | *100.0%* | *100.0%* | *100.0%* |
| **Risk/Return Data** | | | | |
| ROR | 12.65% | 9.02% | 11.36% | 17.01% |
| Standard Deviation | 16.01% | 11.49% | 10.06% | 11.13% |
| Sharpe Ratio | 0.8570 | 0.8661 | 1.1239 | 1.4957 |
| Maximum Drawdown | -11.36% | -11.18% | -9.60% | -11.36% |
| Largest 1-Day Loss | -5.46% | -3.84% | -2.73% | -2.42% |
| **Portfolio Metrics** | | | | |
| Correlation | 1.00 | 1.00 | 1.00 | 0.93 |
| R-Squared | 1.00 | 1.00 | 1.00 | 0.87 |
| Portfolio Beta to Risk Assets | 1.00 | 0.70 | 0.70 | 0.69 |
| Portfolio Beta to Asset Allocation Portfolio | *N/A* | *N/A* | 1.00 | 0.99 |
| **Uncompensated Risk Measurements** | | | | |
| Tracking Error to Asset Allocation Portfolio | *N/A* | *N/A* | 0.00% | 0.28% |
| Active Risk (stated as % of Variance) | *N/A* | *N/A* | 0.00% | 15.82% |
| Weighted Cross Correlation % | *N/A* | *N/A* | 57% | 62% |
| Cross Correlation % | *N/A* | *N/A* | 70% | 67% |
| Number of Portfolio Holdings | *N/A* | *N/A* | 5 | 100 |
| Concentration Coefficient (CC) | *N/A* | *N/A* | 3 | 78 |
| Fama-Booth Total Diversification Return | *N/A* | *N/A* | 0.13% | 1.40% |
| Fama-Booth UCR Diversification Return | *N/A* | *N/A* | 0.00% | 1.27% |

# Assumptions, Limiting Conditions, & Disclaimers

The information contained in this report is intended to provide limited diversification information on how the analyzed portfolios would have performed during the 1-year period ended on September 30, 2016, under circumstances where the number of shares held on September 30, 2016 were assumed to be held throughout the year, and the number of shares held for each position in each portfolio was the same on September 30, 2015 as it was on September 30, 2016. Accordingly, all the portfolios used for this analysis are hypothetical.

Information and data has been furnished by others and such information and data has been accepted as reliable. None of the information or data prepared by outside sources was independently verified for accuracy or completeness. Accordingly, no responsibility is assumed for information prepared and/or furnished by others.

We did not independently verify any of the historical financial data prepared by third parties for accuracy or completeness, and therefore, do not express an opinion or any other form of assurance regarding the historical financial data used in this report.

References made to any specific securities do not constitute an offer to buy or sell securities or a recommendation to buy or sell securities. The past performance of an ETF, mutual fund, individual security, or investment/diversification strategy cannot guarantee its future outcome or performance.

Listed ETF and mutual fund proxies were substituted for unlisted collective investment positions present in all the portfolios. Selection criteria for each proxy was based on estimated similarities to the investment purpose and risk profile of the collective investment being replaced.