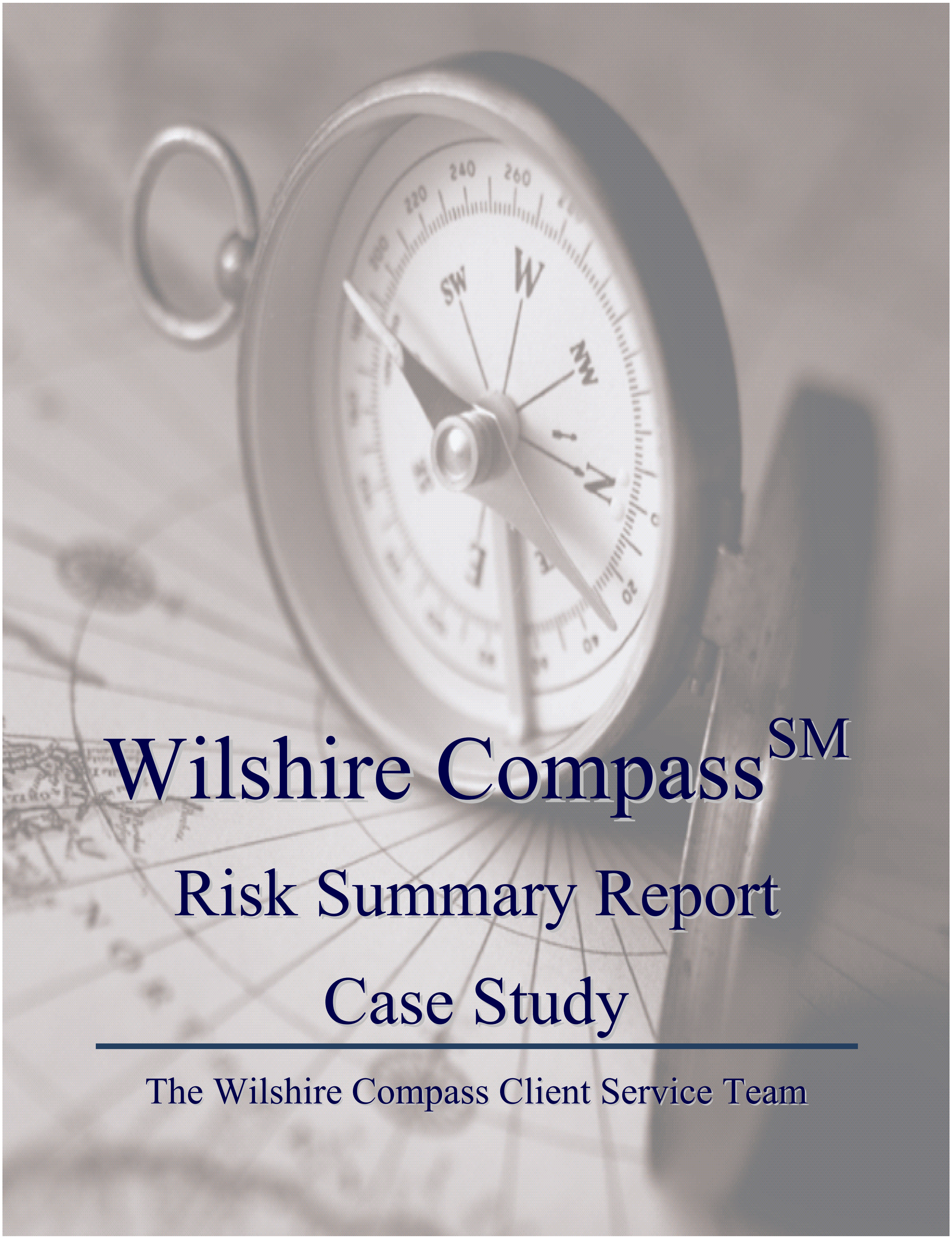


Wilshire Compass[SM]

Risk Summary Report

Case Study

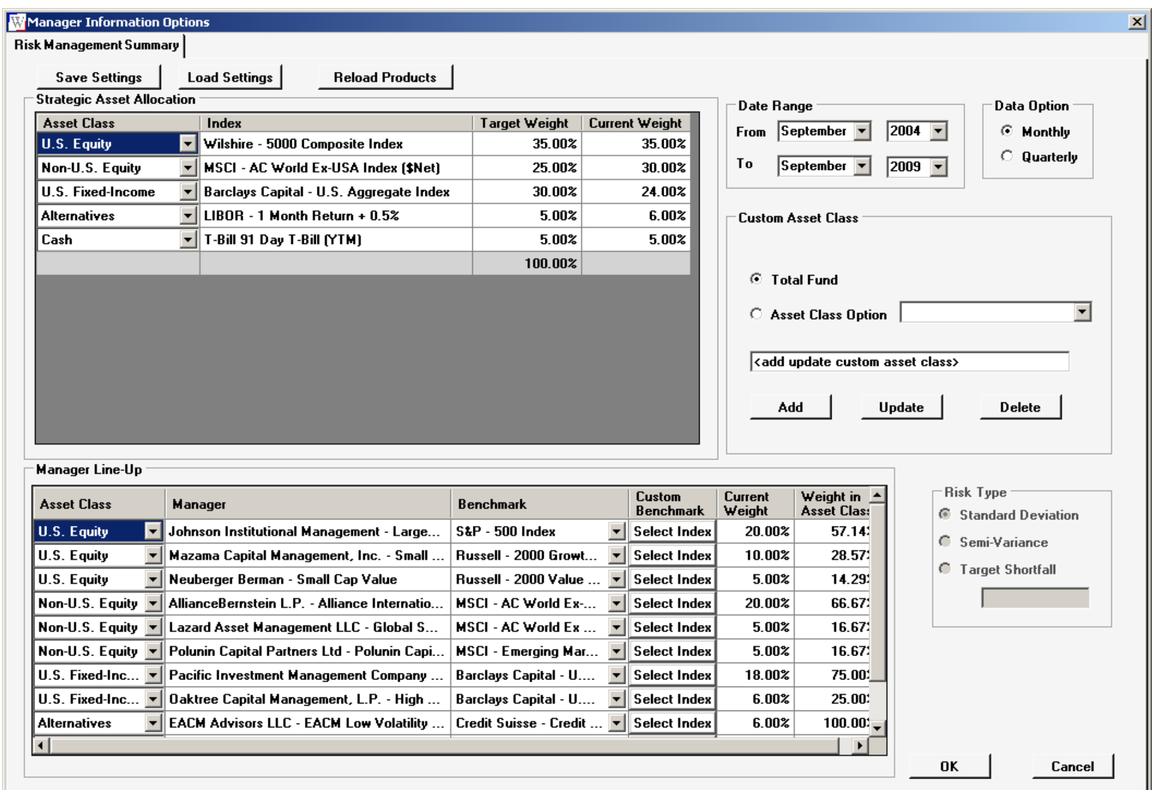
The Wilshire Compass Client Service Team

The following document outlines an example of using Wilshire Compass for Risk Management analysis. For this case study, assume a pension plan with the following strategic asset allocation:

- 35% Domestic Equity
- 25% International Equity
- 30% Domestic Fixed Income
- 5% Alternative Investments
- 5% Cash

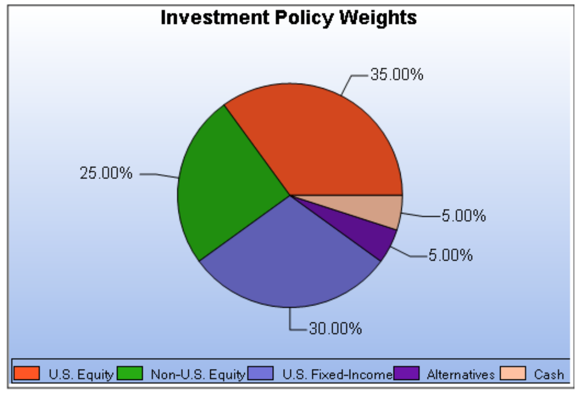
The Plan's investment committee has recently commented on the variability between the Plan's returns and its policy benchmark. The Chief Investment Officer would like to get a detailed look at the sources of this tracking error. Furthermore, once identified, if the risks are not expected to be accompanied by excess return, those risks should be greatly reduced or eliminated. To analyze the situation, the CIO will use the Risk Management Summary report within the Manager Information section.

To begin the analysis, set up the current strategic asset allocation and enter the current manager line-up on the analysis input screen, shown below. Wilshire Compass will calculate all of the risk analysis by measuring risk and correlations over the chosen historical time period.

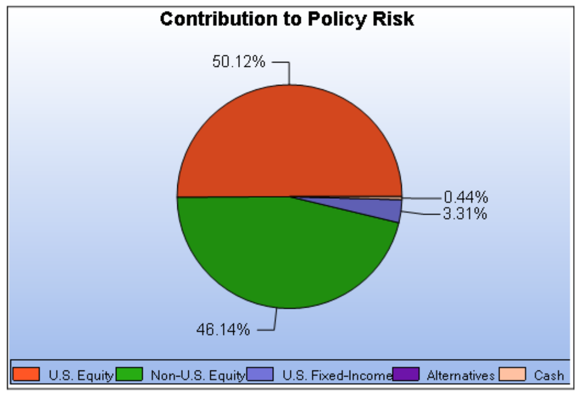


Upon running the analytic, Wilshire Compass will generate a five-page report. These reports can be used to answer the Chief Investment Officer's questions about total risk and tracking error compared to the policy benchmark.

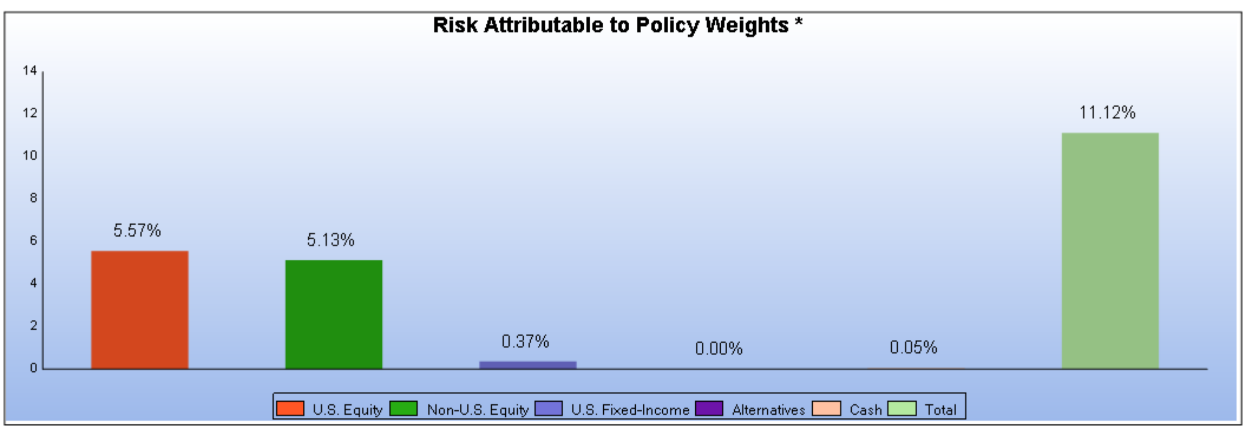
The first page of the report presents several charts summarizing the risk of the strategic asset allocation policy. The first chart, shown at right, contains a graphic depiction of the asset allocation policy weights by asset class.



The next chart, below right, shows the contribution to risk by asset class. For example, consider the U.S Equity asset class. From the first chart, observe that U.S. Equity comprises 35% of the Plan's strategic asset allocation. The second chart illustrates that this 35% allocation accounts for half of the Plan's overall risk! Looking at U.S. and Non-U.S. equity combined, 60% of the Plan's allocation strategy accounts for 96% of the Plan's risk over the analysis period. From a risk budgeting perspective, these two charts alone provide substantial insight into the Plan's sources of investment risk.



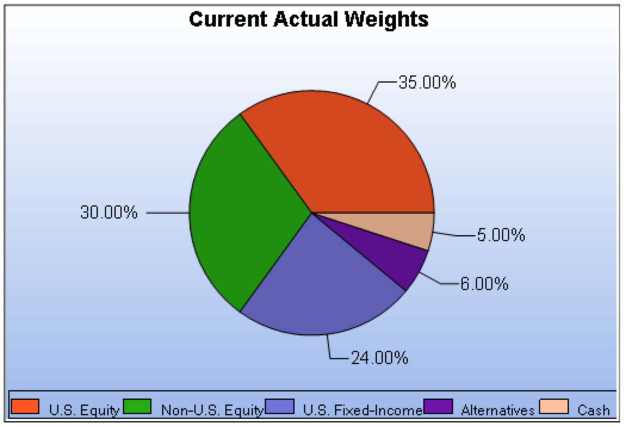
The final graph on the strategic asset allocation page, shown below, contains the actual observed risk due to each asset class. As is the case with all reports in this analytic, the effect of covariance between factors has been calculated into each of the individual risk measurements. From the chart below we can observe that our strategic policy has a total ex-post risk of 11.1% which can be attributed primarily to the equity allocations.

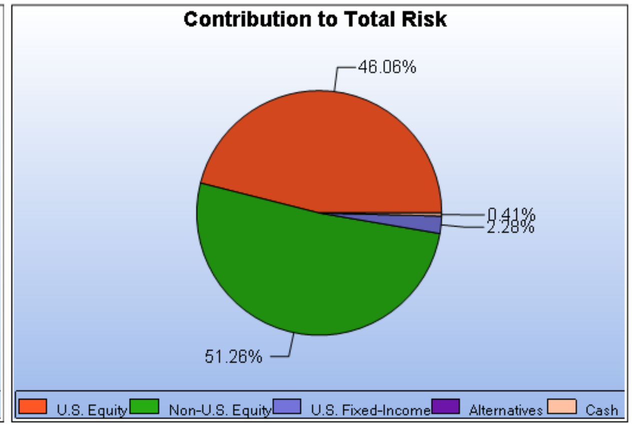


The first page of the report merely showed the risk profile of the asset allocation strategy over the historical observation period. These reports did not take into account the *actual* investment structure or manager performance. Beginning with page 2 of the report, the data deals with the actual

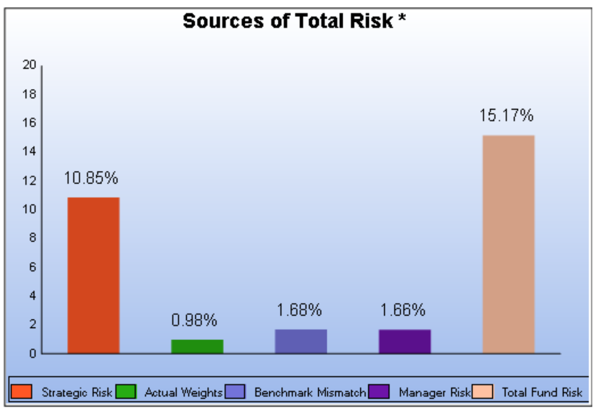
* Risk results represent standard deviation adjusted for correlation

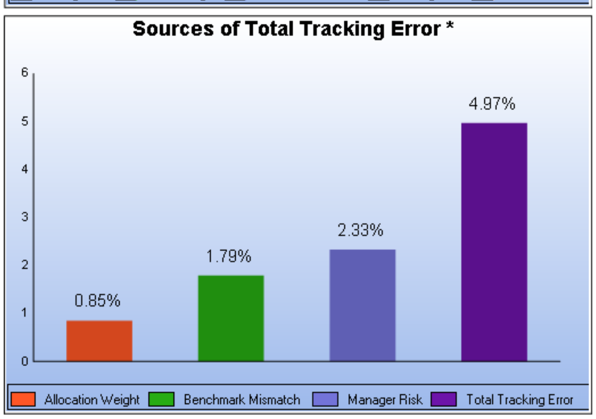
investments rather than just the allocation policy. The first two charts, shown below, are similar to the first two on page one, but now they show the **actual** asset allocation and % contribution to total risk from that actual asset allocation.





An attribution of estimated risk is shown in the next two charts. The first chart, shown at left, breaks down the total plan risk into four sources: strategic risk, allocation weight risk, benchmark mismatch risk, and manager risk. The second chart, shows the same risk sources, but measured as tracking error rather than total risk. These four risk sources are defined to be:





Strategic Risk is the risk due to the strategic asset allocation. This is the risk inherent in the Plan's policy and therefore could be thought of as policy risk.

Allocation Weight is the risk coming from the difference between actual asset class weights and the strategic policy weights.

Benchmark Mismatch is the amount of risk coming from a manager (or collection of managers) tracking a different benchmark(s) than that which is used to measure the asset class as a whole.

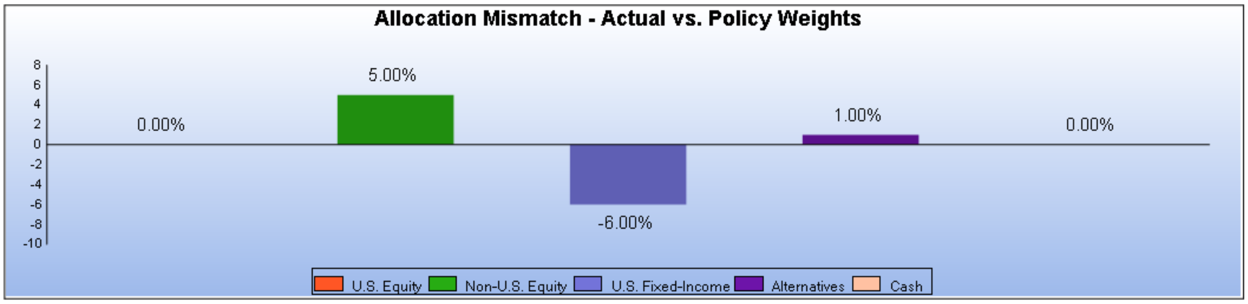
Manager Risk is the amount of risk coming from the investment manager versus its benchmark. This could also be thought of as active management risk or idiosyncratic risk.

From the first chart, we see that the plan has taken about 4.3% more risk than the strategic allocation (15.17% vs. 10.85%). Furthermore, about 1% of the additional risk is due to misalignment of asset class weights, about 1.7% is due to a mismatch in benchmarks, and about 1.7% is due to active management

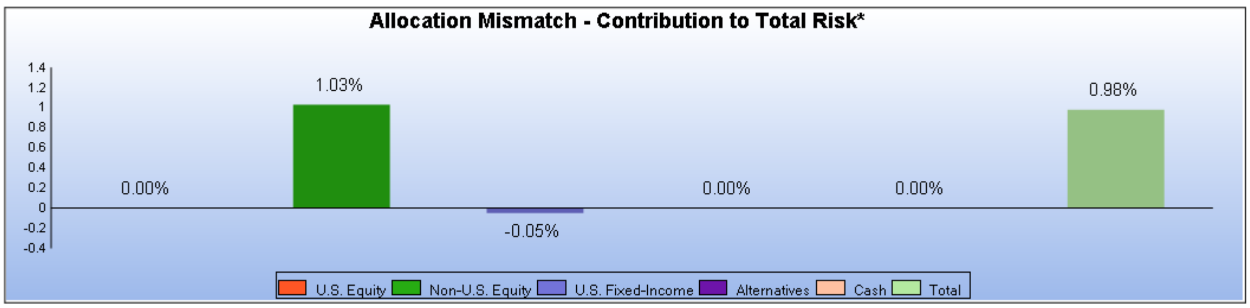
* Risk and Tracking Error results represent standard deviation adjusted for correlation

(or other manager specific risk). The second chart shows the same factors but viewed in tracking error relative to the strategic asset allocation policy. The final three pages of the report break down each source of risk by asset class and allow the user to draw some meaningful conclusions.

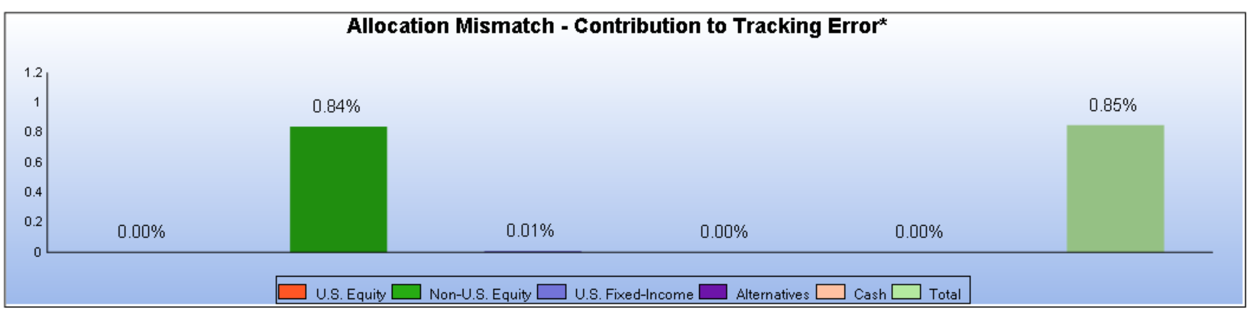
Allocation Weight Mismatch (Report Page 3)



- The Plan is overweight Non U.S. Equity by 5% and Alternatives by 1%, and underweight Fixed Income by 6%. This leads to significant potential risk at the Plan level due to differences in the relative risk of the overweight and underweight asset classes.



- The 103bp increase due to the 5% Non-U.S. Equity overweight is only offset by a 5bp decrease due to Fixed Income underweight.
- The effect of our mismatch on tracking error is shown below. The chart is very similar to the total risk chart. Most of the estimated future tracking error would be expected to come from the Non-U.S. Equity overweight.



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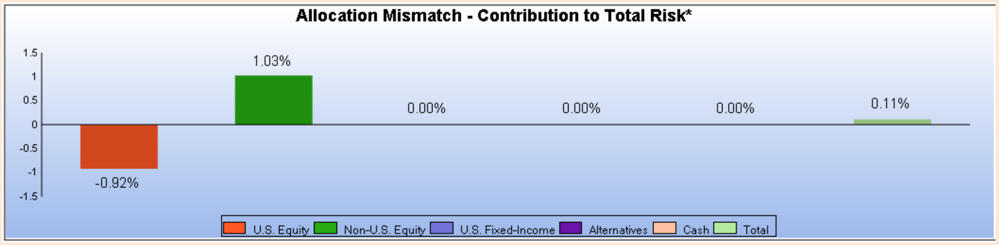
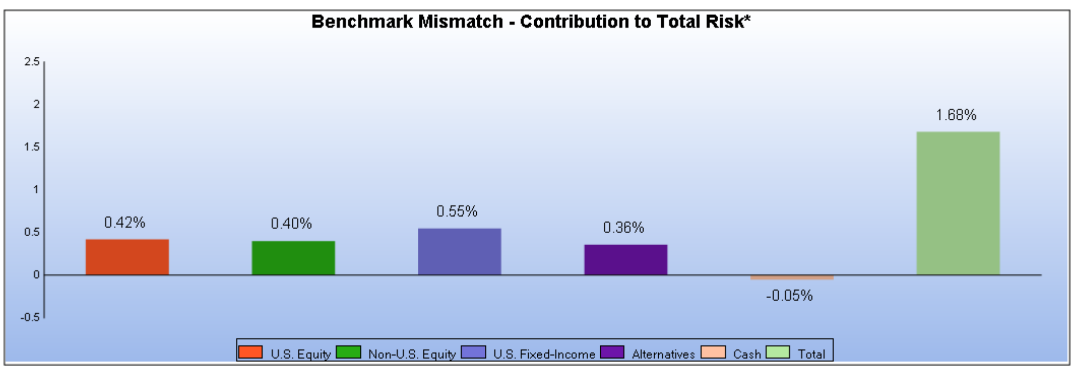
For Further Illustration

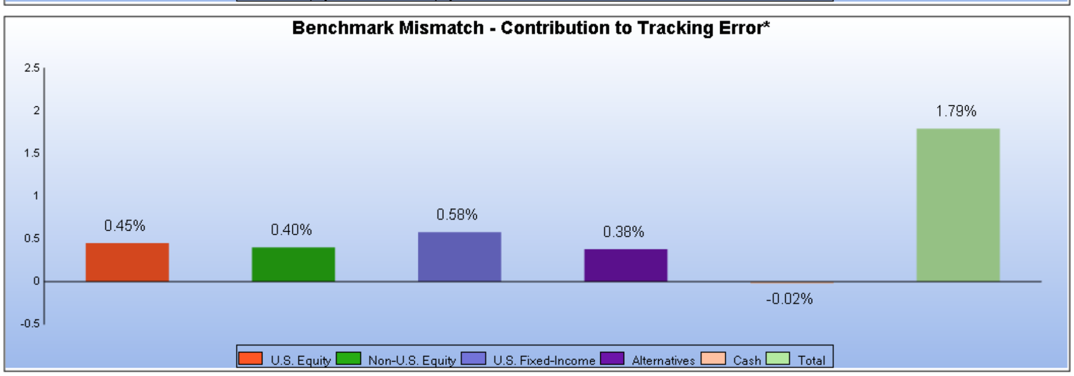
The chart below shows that if the underweight had been in U.S. Equity instead of Fixed Income, the net increase in total risk would have been substantially less. The 103 basis points of additional risk due to the Non-U.S. equity overweight would be countered by 92 basis points of risk reduction coming from the underweight to U.S. Equity. This illustrates that counterweight positions in asset classes of similar total risk can serve to offset one another.



Benchmark Mismatch

- This report shows how the risk of each asset class' composition compares to its strategic benchmark. For example, the Plan's benchmark is the Wilshire 5000 Total Market Index℠ for U.S. Equity. The weighted aggregation of the individual asset managers' benchmarks, however, does not approximate the Wilshire 5000. The charts below show the expected impact of this effect on total risk and tracking error.



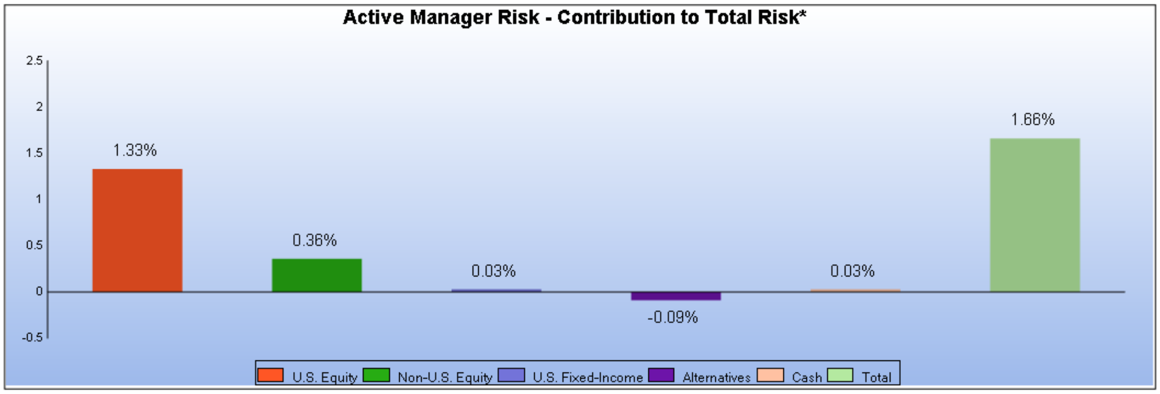


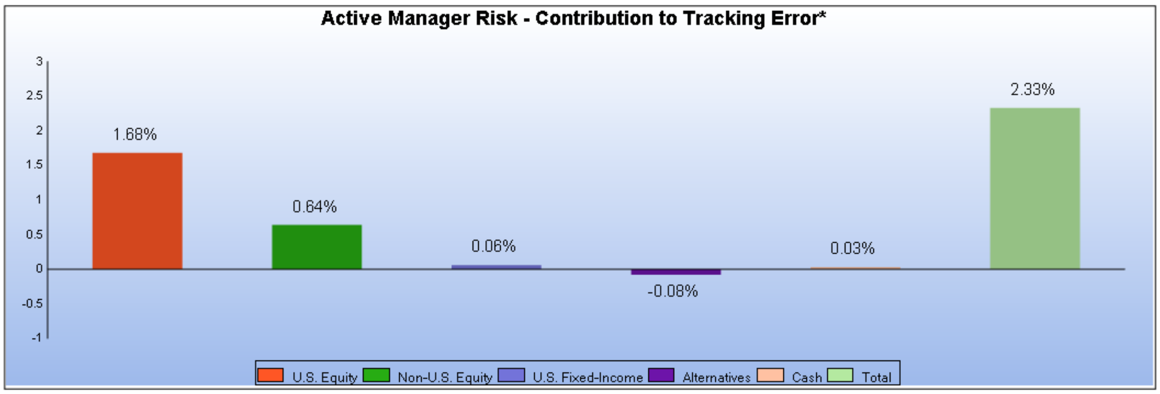
* Risk and Tracking Error results represent standard deviation adjusted for correlation

- The Plan has benchmark mismatch issues in every asset class except cash. The information below takes a closer look at each asset class to see why this mismatch occurs.
- U.S. Equity – Strategic Benchmark: Wilshire 5000
    - Within this asset class, the current allocation is approximately 57% Large Cap, 29% Small Cap Growth, 14% Small Cap Value all benchmarked to corresponding Russell indices.
    - The first mismatch problem is that the small cap weights (43% total) are much higher than the Wilshire 5000's weight to small cap, leading to an increase in total risk and the introduction of tracking error.
    - The second source of mismatch comes from structural differences between the Russell and Wilshire benchmarks.
- Non-U.S. Equity – Strategic Benchmark: MSCI ACWI ex USA ($Net)
    - Within this asset class, the current allocation is approximately 67% ACWI manager, 17% international small cap, 17% emerging markets.
    - Similar to the U.S. Equity asset class, the 17% exposure to international small cap and emerging sectors, when combined with the exposures already present in their ACWI manager, is a sizable departure from the index. This leads to an increase in total risk and the introduction of tracking error.
- U.S. Fixed Income – Strategic Benchmark: Barclay's Aggregate
    - This allocation contains a 25% allocation to a high yield manager. As high yield is not a component of the benchmark, it leads to benchmark mismatch. In addition, high yield generally has a higher absolute risk level than core bonds, and as a result the inclusion of high yield also increases total risk.
- Alternatives – Strategic Benchmark: LIBOR+50
    - The one hedge fund manager is benchmarked versus the Credit Suisse/Tremont Hedge Fund Index. This is clearly a direct mismatch with our asset class benchmark. Particularly over recent periods, LIBOR has experienced far less volatility than hedge fund returns leading to benchmark risk and increased tracking error.

Manager Risk

- This category shows how each manager's active management risk has contributed to the Plan level total risk and tracking error. Keep in mind these active management risk components are being viewed in the context of a full correlation structure with all of the previously discussed risk factors. The charts on the top of the next page show both the absolute risk and tracking error broken down by asset class.





- The majority of the Plan's manager risk is coming from the equity asset classes.
- It is interesting to note that the alternative manager's active risk is somewhat of a diversifier (by only 9bp) when viewed in context of the whole Plan.

Final Analysis

Going through this thorough analysis of the Plan's risk results in the following conclusions:

- Relative to the Plan's Policy based upon historical data, the overweight in Non-U.S. Equity would be expected to lead to almost 100bp of additional risk and more than 80bp of tracking error. An observation that clearly provides support for implementing a structured rebalancing program.
- Additional total risk and tracking error results from allocations in high yield fixed income, non-U.S. emerging market equity, U.S. small cap equity, and non-U.S. small cap equity. In total, these mismatches amount to about 200bp in both total risk and tracking error. Depending upon specific philosophical beliefs the Plan should consider:
    - Scaling back the allocations which are causing the mismatch.
    - Choosing new asset class benchmarks that more accurately reflect the strategies being implemented.
    - Adding new asset classes to the policy benchmark to more accurately reflect the character and risk of the Plan's intended investments.

* Risk and Tracking Error results represent standard deviation adjusted for correlation