1. **CURRENT RISK WEIGHTINGS OF SUBADVISORS**
   * Example:

*Risk weights in LSE as of 5/10/2016 – by SubAdvisor*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Current Portfolio** | **Exposure Weight** | **Volatility Weight** | **Difference** | **Contribution to Vol (annualized)** | **Marginal Contribution To Vol (annualized)** | **Correlation To Portfolio** | **Standalone Vol (annualized)** |
| Apis | 43.3% | 65.0% | 21.7% | 2.9% | 6.7% | 0.87 | 7.7% |
| Coe | 17.5% | 7.9% | -9.6% | 0.4% | 2.0% | 0.41 | 5.0% |
| ISF | 39.2% | 27.1% | -12.1% | 1.2% | 3.1% | 0.65 | 4.7% |
| **Total** | **100.0%** | **100.0%** | **0.0%** | **4.5%** |  |  |  |

* + Notes
    1. Volatility Weight = (Contribution To Vol) /( Total Portfolio Vol)
       - represents their “risk-weight” in the portfolio
    2. Contribution to Vol = (Weight in Portfolio) \* (Standalone Vol) \* (Correlation to Portfolio)
       - So an asset’s contribution to volatility depends on three things
         1. Weight in Portfolio
         2. Standalone Vol
         3. Correlation to Portfolio (this also depends on weight, however)
    3. Marginal Contribution to Vol = (Standalone Vol) \* (Correlation to Portfolio)

= (Contribution to Vol) / (Weight in Portfolio)

* + - * *This is the most relevant number to portfolio management decisions!*
      * *This number represents the amount that portfolio volatility will change for every unit increase in weight, holding weights of other assets constant (unit increase = 100%)*

*It can be shown that marginal contribution to vol is the derivative of portfolio vol with respect to the asset’s weight*

* + 1. The current allocations are more relevant to risk monitoring than historical allocations
       - Therefore, analyzing a portfolio constructed from the current manager weightings is more useful than analyzing the historical portfolio
       - Example of the Difference: Historical vs Current Allocation:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Historical Portfolio | Current Portfolio | *Difference* |
| Volatility – past 126 days | 8.75% | 6.57% | ***-2.18%*** |
| Volatility – past 252 days | 8.65% | 7.13% | ***-1.53%*** |
|  |  |  |  |
| EWMA Vol – 5/10/2016 | 4.67% | 4.57% | ***-0.10%*** |
| EWMA Vol – 4/29/2016 | 5.02% | 4.82% | ***-0.20%*** |
| EWMA Vol – 3/31/2016 | 7.32% | 5.98% | ***-1.33%*** |
| EWMA Vol – 12/31/2015 | 6.96% | 5.22% | ***-1.74%*** |

* + Development Status –
    - * ready to go, but could be improved
    1. What is ready:
       - Risk Weightings using either Volatility, VaR, or Expected Tail Loss and with the assumption of a Gaussian/Normal Distribution and Exponentially Weighted Decay in Volatility
    2. What could be improved:
       - incorporating higher moments into the EWMA model – e.g. interactions between assets such as such as co-skewness and co-kurtosis

1. **HOW RISK WEIGHTINGS, PARTICULARLY MARGINAL CONTRIBUTION TO RISK, OF SUBADVISORS HAVE CHANGED/IS CHANGING OVER TIME**
   * We could use historical contribution data, but as we saw above, the true risk contribution at any point in time is based on the weights at that point in time. We need both manager returns and historical manager weights
2. **OPTIMAL MIN-RISK PORTFOLIOS OVER DIFFERENT TIME PERIODS**
   * **E.g.**
3. **STABILITY & CHANGEPOINT ANALYSIS**
   * Identify changes in distributions
     + - Change points in variance
       - Change points in mean
       - Change points in mean/var
   * Identify changes in relationships vs Markets
     + - Changes in beta vs SP
       - Is the assumed relationship still true?
         1. Eg. If we assume that we run at a beta of x, is that still true? If not, we should know when it has changed
4. **SIMPLE RISK OR VOL, RELATIVE TO BENCHMARKS**
5. **BRINSON DECOMPOSITION OF VOLATILITY RELATIVE TO BENCHMARK**
   * Where are we taking more or less risk relative to the benchmarks
   * Requires data for benchmark weights
6. **SENSITIVITY ANALYSIS/STRESS TESTING**
   * To identify portfolio factors we aren’t seeing as obvious