Russell Investments has researched, discussed and written about the many guises of risk for decades. Risk is an important and complicated topic that is often best understood by focusing on one particular aspect.

**Introduction**

In this paper, our intention is to define some of the key risk metrics non-profit organizations should consider using to measure their portfolio performance, and to encourage the establishment of specific risk guidelines so that the purpose of each risk metric can be known and each can be measured and monitored in the portfolio. Some of this may be done within the investment policy statement (IPS) if there is a need or strong preference for hard targets, or separately articulated in portfolio management guidelines.

As often as not, the policy statements offer minimal guidance as to acceptable levels of investment risk. For example, a typical IPS may provide significant details on acceptable investments, asset allocation allowances and benchmarks, but when it comes to risk, there may be no reference at all – or very limited language, similar to:

- “The investment portfolio should not take unnecessary/undue risk.”
- “Risk levels should be in line with the level of desired return.”
- “The assets are to be managed in a manner designed to meet the primary investment objectives over the long term, while at the same time attempting to limit volatility in year-to-year spending.”

None of the examples noted above provide the detailed guidance investment managers require in order to manage risk in a manner consistent with an organization’s mission objectives. We believe a clearly articulated risk statement should include the following:

1. The time period over which risk will be measured.
2. The organization’s risk philosophy, e.g.,
   a. “Losses greater than X% of portfolio over Y time frame are unacceptable.”
   b. “Underperforming CPI + X% over the Y time period is unacceptable.”
3. A definition of which risk measures are important to the organization (see discussion below; it is likely that an organization should use more than one approach to measuring and assessing risk).
4. A definition of specific benchmarks and of how each will be used to evaluate absolute and relative investment risk.
5. Quantification of the maximum acceptable level of risk for each risk measure, e.g.,
   a. Annual volatility, 15%.
   b. Annual tracking error, 2%.
   c. Maximum drawdown is $X or Y% in any one year.
In managing multi-asset portfolios, Russell’s portfolio managers use a variety of tools that stress-test and analyze a portfolio under a multitude of conditions and scenarios. Of these, there are six important metrics, which we encourage our clients to understand and define at their comfort level. The six measures are:

1. Beta,
2. Volatility,
3. Tracking error,
4. Active share,
5. Value at risk, and
6. Maximum drawdown

The paper defines each of these metrics, describes how they are best used and provides an example of each.

**Risk metrics**

**1. Beta**

Beta is a measure of the volatility of a security or portfolio in comparison to that of the market as a whole. The calculation is regression-based, and it uses the ratio of the portfolio’s volatility to that of the market’s volatility and the correlation of the portfolio’s return to the market’s return.

- A beta of 1 implies that the portfolio’s value will move with the market.
- A beta of less than 1 implies that the portfolio’s value will move less than the market does. For example, a beta of 0.8 implies that the portfolio will move up/down at 80% of the market move.
- A beta greater than 1 implies that the portfolio’s value will move more than the market does. For example, a beta of 2.0 implies that the portfolio will move up/down at 200% of the market move.

Two of the limitations of beta are, first, that beta uses historical data/relationships; therefore, there is no way to incorporate new information into the calculation. For example, imagine a multi-asset-class portfolio that adds a new and significant allocation to emerging markets equity. Clearly, the risk profile of the portfolio has changed; however, historical data may not capture this change, and therefore neither would the beta. Second, beta can vary—particularly when shorter historical time periods are used in the calculation, which means that managing a portfolio to a specific beta target is difficult, especially over shorter time periods.

**How to use beta**

- **Best use:** Use beta to make a quick assessment of a portfolio’s risk relative to its benchmark.

- **Compare betas of different portfolios:** Two portfolios with significantly different betas would imply that one of the portfolios is riskier than the other, assuming that past relationships hold in the future. Be sure that the data used for both portfolios covers the same time period.

- **Compare a portfolio's beta changes over time:** For example, one might calculate the portfolio’s beta at the end of each fiscal year and compare several years of calculations. Is there a trend? Has beta increased in each of the last three years? If so, why? The answer to “why” the betas have changed could be that the risk profile of the portfolio has changed, due to the addition of new asset classes or to differences in allocations to asset classes. The point is to understand whether asset managers consciously altered the risk profile of the portfolio by making structural decisions, or unknowingly increased/decreased the portfolio’s exposure to risk.

**2. Volatility**

Volatility is perhaps the most commonly referenced risk measure, but is also likely one of the most misused and misunderstood. Typically, when clients think of volatility, it is in terms of how volatile the monthly returns of their investment portfolios are. Generally, this volatility is measured by calculating the standard deviation of the portfolio's monthly returns. But what does a volatility figure of 15% mean—is 15% good or bad? Does it imply that the portfolio is taking too much or too little risk? Does more/less volatility improve/decrease a non-profit’s probability of achieving its mission objectives?

**How to use volatility**

- **Best use:** Either at the total portfolio level and/or the specific asset-class level. The key is to ensure that you have an appreciation for typical volatility levels for the portfolio/asset class, in order to determine whether measured volatility is outside of “normal.”

- **Set realistic expectations about absolute level of risk:** Assume that you have a diversified portfolio that includes hedge funds and private markets investments, with a targeted return of 8.8% and a standard deviation of returns (volatility) of 12.55%. Without going through all the statistics here, this implies that nearly 24% of the time, the portfolio will have a negative return. To say it another way: In nearly 1 year out of 4, the portfolio will experience a negative return. Is your investment committee comfortable with that possibility? Are they comfortable with the impact it could have on your spending rate and your progress toward meeting your mission objectives?

- **Compare volatility of different asset allocations and/or portfolios:** For example, if Portfolio A has a volatility of 15% and Portfolio B has a volatility of 10%, you can conclude that A is “more” risky than Portfolio B. This type of comparison is very useful if you are considering changes to an asset allocation and want to know if the changes increase or decrease volatility, and by how much.
3. Tracking error

Tracking error (TE), either predicted or realized, measures the volatility of benchmark-relative performance and is defined as the standard deviation of a portfolio’s excess return expressed in percentage terms (e.g., 2% TE per annum). Given that TE is a benchmark-relative measure of risk (as opposed to volatility, which is a measure of the absolute level of risk), it should not be a surprise that an index fund would have very low TE (i.e., not zero, but certainly much less than 1%), while an actively managed fund will have higher TE (i.e., TE that varies with investment style/goal, but where 2% and above is a common target). To be clear: A predicted TE of 2% does not mean a portfolio is likely to realize 2% TE each and every year. As you might imagine, in any given year, a portfolio might experience higher or lower than expected tracking error.

How to use tracking error

- **Best use**: TE can be used to measure risk at either the total portfolio level or the specific asset class level. The key is to ensure that you have an appreciation for typical TE levels for the portfolio/asset class in order to determine if measured TE is outside of “normal.” Additionally, as TE is a benchmark-relative measure of risk, it is critical that the benchmark is defined properly.

- **Defining benchmark-relative risk tolerance**: Define a specific level of TE as one of your risk measures within the portfolio-management guidelines, to help ensure that your CIO, investment committee and board clearly understand what is an acceptable level of benchmark-relative volatility.

4. Active share

Active share is a benchmark-relative risk measure that is designed to highlight a portfolio’s degree of deviation from the passive benchmark, based on portfolio holdings (i.e., it is not a returns-based risk measurement, such as TE or volatility). In essence, active share (AS) is a way to determine whether a portfolio is actually a “closet indexer” or is significantly different from the index. An AS score of 0% implies that the portfolio is essentially an index fund, and an AS score of 100% implies that the portfolio is completely different than the benchmark.

However, caution is warranted to ensure that the user of AS does not read too much into the results. Why? For two reasons, mainly. First, AS says nothing about the risk taken: Being different than a benchmark (i.e., having a high AS score) does not mean that a portfolio will outperform/underperform its benchmark. In other words, the portfolio must be different than the benchmark in the “right” ways at the “right” times in order to outperform. And second, its being different from a benchmark doesn’t guarantee that the portfolio’s performance will differ significantly from that of the benchmark. One simple explanation is that while a portfolio may have a high AS score, the holdings may have a high correlation to the underlying benchmark.

How to use active share

- **Best use**: Active share is best used to measure active risk for public equity portfolios. AS is less useful for other asset classes that have benchmarking issues, such as absolute-return funds, which are typically benchmarked against cash plus some number of basis points. Bond portfolios are another example where AS is less useful, given the large number of securities that have similar characteristics, but may be “different” from the benchmark purely from an AS calculation standpoint. For example, two individual mortgage-backed securities are considered different and unique because they have unique security IDs (CUSIP numbers); however, the performance of the two securities may be highly correlated, because the only difference between two mortgage bonds may be a small difference in the coupon rate. The result is that a fixed income portfolio may have a high AS score, but its performance may be similar to that of the index.

- **Setting realistic expectations about benchmark-relative performance**: Remember that a high AS score does not mean the portfolio will beat the benchmark; it simply means the portfolio may perform significantly differently than the benchmark (good or bad).

5. Value at risk

Value at risk (VaR) measures the potential extreme loss in value of a portfolio over a defined time period and for a given level of confidence. To calculate VaR, we need 1) a specified level of loss 2) a time period covering the risk assessment and 3) a confidence interval. Convention suggests that confidence intervals are usually set to either 1% probability or 5% probability (called 99% or 95% VaR, respectively). Time periods are typically short (one day, one week or a few weeks). The typically short horizon implicitly confirms that VaR changes over time; therefore, the longer the time period, the less likely it is that the portfolio or the market conditions will remain relatively stable.

For example, a one-day 95% VaR of $2M for a portfolio indicates a 5% probability that the portfolio will fall in value by more than $2M over a one-day period, due to market risk. The VaR is an indication that the portfolio will experience a loss of $2M, or more, during one day of any 20-day period (i.e. because of the 5% probability).

How to use value at risk

- **Best use**: For liquid, daily priced assets and portfolios, but care should be taken if the characteristics of the market change (i.e. significant changes to the level of liquidity or large portfolio cash flows occur). Great care should also be taken in defining the VaR confidence level and time period covered as the choice of these factors significantly influences the result.

- **Comparison of VaRs across different portfolios**: Portfolios with higher VaRs are considered to have higher extreme risk.
6. Maximum drawdown

Maximum drawdown measures the peak-to-trough decline of an asset class or portfolio; it is used to gauge an investor's ability to withstand a large loss (large drawdown). The larger the drawdown, the greater the downside risk of the portfolio. However, one shortcoming of this metric is that it addresses only the potential size of a loss; it does not address the possible frequency of large losses.

How to use maximum drawdown

- **Best use:** While maximum drawdown can be measured over any historical period, from a portfolio construction standpoint, combining forward-looking scenarios or stress testing with maximum drawdown analysis is most useful. As an example, we can take today's actual holdings/portfolio asset allocation, apply stress tests that simulate how the current holdings would have been impacted during different economic scenarios, and calculate the maximum drawdown. The resulting figure would indicate what the DD would be, if the forecast economic scenario actually occurred. This insight could help you determine whether there is too much or too little risk in your portfolio.

- **Assessing spending policy:** Combining the maximum drawdown/stress testing/scenario testing with a spending policy review can help interested parties understand how such a drawdown could negatively impact future spending ability. Using this information may lead decision makers to reassess the risk allowance stated in the IPS, which in turn may lead to a different strategic asset allocation.

**Conclusion**

We have presented background for several key risk metrics and how they might be used. We believe the best way to start is to begin by running a spending study and a portfolio/scenario analysis. These studies can provide the basis for discussions with your investment committee and fiduciaries. You should be able to identify which metrics are most meaningful for your needs and to articulate targets for them.

A few final comments regarding risk management:

- Risk management is as important a consideration as return generation.
- Remember that risk management is part quantitative science, part interpretive art.
- Risk management is an iterative process in that it requires constant reassessment of the trade-offs between generating the required return within the bounds of the required level of risk taken.
- The most effective risk management process involves the use of more than one risk metric.

**AUTHOR:** Mike Ruff

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