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Portfolio selection: The solver isn't the solution.

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Developing capital market assumptions (CMAs)—expected returns, volatilities, and correlations across asset classes—is an incredibly important step in constructing portfolios and developing financial plans. Used properly, CMAs can help investors to better diversify their portfolios and establish reasonable expectations around the range of likely investment outcomes they might see over various time horizons. But to harness this powerful tool, it is important to understand the appropriate application of CMAs—and the potential dangers in their misuse.

"It is difficult to make predictions, especially about the future." While this quote has been variously attributed to figures as disparate as Niels Bohr and Yogi Berra over the years, the sentiment rings true regardless of its source; prognostication is a tough business. SEI is extremely proud of our process for developing CMAs, and we believe our estimates to be unusually good, but any forecast is subject to estimation error. We employ a variety of techniques to minimize this error, but no one can eliminate it entirely. Regardless of where investors source their CMAs, these assumptions should be viewed as just one component of a robust portfolio construction process, tempered with sound judgement and an acknowledgement of uncertainty.

Exhibit 1: What CMAs are and aren't.

CMAs are:	CMAs are not:
• Essential inputs for portfolio construction and Monte Carlo simulations • Valuable tools in establishing reasonable asset class and portfolio expectations for return, risk, and correlation • Thoughtful representations of relationships among asset classes • Ranges of potential future return paths helpful in estimating the likelihood of achieving one's financial goals	• Perfect predictors of asset class or portfolio returns • Specific predictions of outcomes to be realized over any particular time horizon • Infallible metrics to be used as the only objectives in portfolio optimization • Point estimates to be optimized to the basis point (e.g., by running a "solver" to maximize expected portfolio return or Sharpe ratio with no governor/constraints)

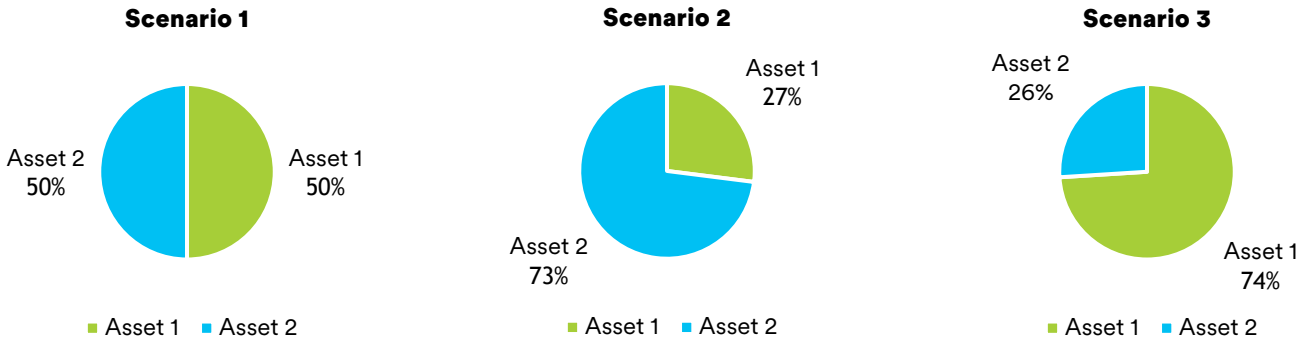
Source: SEI.

Pure mean-variance optimization—assuming one's CMAs are perfect and maximizing expected risk-adjusted returns based on those exact estimates—is notoriously fragile. Small changes to CMAs, particularly expected returns, can lead to extreme shifts in ostensibly optimized portfolio weights. Given the inherent imprecision of any forward-looking estimate, this vulnerability poses a significant challenge to constructing optimized portfolios based on CMAs alone; unconstrained mean-variance optimization requires a degree of precision that is unrealistic for any forward-looking assumption.

To illustrate this extreme sensitivity through an example, assume we only have two available asset classes, each with 20% expected volatility and an expected correlation of 0.9 to one another (these could represent, for instance, two different regions' equity markets). Consider three scenarios:

- **Scenario 1:** Both assets have an expected excess return above cash of 5% per year.
- **Scenario 2:** Asset 1's expected excess return is 5%, while Asset 2's is 5.25%.
- **Scenario 3:** Asset 1's expected excess return is 5%, while Asset 2's is 4.75%.

Exhibit 2: Sensitivity of pure mean-variance optimization to small differences in CMAs.



Source: SEI.

In the baseline scenario (Scenario 1), the two assets have the same expected risk and return. Unsurprisingly, pure mean-variance optimization allocates the portfolio evenly between them. But when we shift Asset 2's return by a mere 25 basis points, it yields drastically different results. Since this level of precision in forecasting returns (+/-0.25%) is virtually impossible for most asset classes (let alone one with 20% expected volatility), the sharp contrast arising from this modest shift in expected returns highlights the challenges arising from pure mean-variance optimization.

Since the optimizer (or "solver") views these modest differences as being known with absolute certainty, it returns wildly different results under each scenario. In Scenario 2, Asset 2's weight rises to over 73% of the supposedly optimized portfolio, while in Scenario 3, it falls to nearly 25%. These are dramatic shifts in recommended portfolio weights—and meaningful reductions in the portfolio's level of diversification—based solely on what could generously be described as a rounding error in expected return.

This exercise underscores what we mean by the appropriate use of CMAs. While they are an indispensable tool in constructing portfolios, and no financial plan is complete without them, building portfolios with no other objective than maximizing a single point estimate for Sharpe ratio will likely prove counterproductive. We recommend a softer form of optimization that supplements estimated Sharpe ratios with additional metrics, both historical and forward-looking. This is also important in assessing potential portfolio changes: rather than strictly choosing the portfolio with a slightly higher estimated return (or slightly lower estimated risk), it is important to consider other metrics, economic intuition, and portfolio balance, among other factors.

When in doubt, diversification is generally the wise choice—not merely because it makes one's portfolio less reliant on any single asset class, but because it makes one's financial plan less dependent on any one assumption being perfectly precise. If an optimizer recommends an allocation tilted heavily toward one asset class, it is worth asking whether it is anchored too heavily to an error-prone estimate. Our CMAs are designed to equip investors with a best-in-class understanding of the ranges of potential portfolio outcomes, but that is only half the battle. It is also crucial that asset allocators use them wisely.

GLOSSARY AND INDEX DEFINITIONS

For financial term and index definitions, please see: https://www.seic.com/ent/imu-communications-financial-glossary

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