Insights
Asset Allocation

June 2023

Mastering Asset Allocation Strategies

Insights Gained from SPDR Portfolio Consulting

Daniel Ung, CFA, CQF, CAIA, FRM
Head of Quantitative Research & Analysis SPDR ETF Model Portfolios, State Street Global Advisors

Kartik Chawla
Senior Quantitative Research Analyst, SPDR Model Portfolio Solutions EMEA & APAC

Jedrzej Miklaszewski
Quantitative Research Analyst, SPDR Model Portfolio Solutions EMEA & APAC

The SPDR Portfolio Consulting Service has conducted deep-dive portfolio analysis for clients during the past three years. In this paper, we look at three common issues that investors face, describe how these issues manifest in common practice, and offer suggestions for how investors can take steps to improve their asset allocation strategies.

To support clients in their investment journey, the SPDR Quantitative Research and Analysis Team offers a bespoke portfolio analytics service — the SPDR Portfolio Consulting Service — to clients who wish to retain control over their asset allocation and implementation decisions. We recognise that clients have their own unique needs at every step of their portfolio allocation journey and, through a consultative approach, we aim to generate detailed analysis and provide additional ideas to clients so as to help them meet their ever-changing portfolio challenges.

These challenges encompass a variety of topics and may include improving investment portfolio resilience, planning for uncertainty, and better understanding emerging portfolio risks. Through a range of tools at our team's disposal, we can help clients realise their goals while taking into account their constraints. We achieve this by conducting scenario testing, portfolio objective alignment checks, financial and sustainability risk analysis, and portfolio optimisation, among other analyses.

The SPDR Portfolio Consulting Service has just reached its three-year anniversary. Having analysed a number of portfolios during this period, we are now able to share our insights, to discuss the asset allocation challenges that often confront investors, and to examine some possible solutions to these challenges.

The main findings in this paper can be summarised as follows:

Issue	Common Practice	Suggestions
False Sense of Diversification	• Using the number of constituents as a proxy for the level of portfolio diversification.	• Consider **using measures such as: risk contribution**, diversification ratio and effective number of bets. • Conduct **a risk decomposition analysis** to ensure there are no significant pockets of risk concentration if the objective is to have a diversified portfolio. • Where the objective is to place a conviction trade, ensure that the allocation is sizeable enough to have an economically meaningful impact.
Limits of Expectations and History	• Gleaning information from realised risk and return data.	• **Historical risk information is more meaningful** than return information because **volatility numbers tend to cluster together**. • **Ex-ante risk decomposition can help investors understand their portfolio biases.**
Balancing Multiple Objectives and Constraints	• Expecting to achieve portfolio objectives with optimisation by using sample data.	• The optimisation process can help identify solutions that appropriately trade off on the variables of interest but is not a panacea. • It is important **to prioritise objectives and constraints**. • Judge the portfolio on a total return basis. • Avoid overfitting by examining the sensitivity of the optimisation parameters. • Parameters that are included in the optimisation process may be subjected to estimation risk and perform poorly in real life (i.e. out of sample). — Consider **denoising the covariance matrix (e.g. Marchenko-Pastur or Ledoit-Wolf)** — Consider modelling uncertainties directly into the optimisation using robust portfolio optimisation.

False Sense of Diversification

Diversification is the only free lunch in finance, as Markowitz was reported to have said. More recently, Willenbrock (2011)[1] suggests that diversification should be more appropriately described as the only "free dessert" because it is the incremental return earned while maintaining a constant risk profile. What these two authors agree on is that there is potentially some benefit to be accrued from diversification and, therefore, it is important to measure diversification accurately.

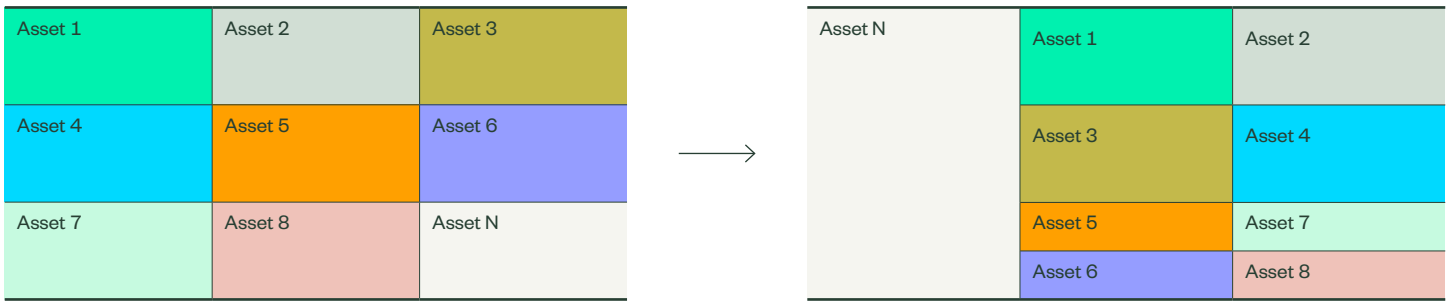
Often, there is the temptation to judge how diversified a portfolio is on the basis of the number of investment funds present. This can be highly misleading and can create a false sense of diversification because it does not take into account cross-asset correlation or the marginal level of risk that each building block contributes to the overall portfolio.

A more effective way to measure diversification is to look at risk contribution. Risk contribution measures look at the allocation of capital from the perspective of risk, rather than just the weight allotted to a particular fund in the portfolio and accounts for the correlation between the portfolio constituents. This is important because, while two building blocks may have the same weight in the portfolio, their contribution to risk is likely to be different, especially if the behaviour of the two building blocks is fundamentally different, as in the example of equities and fixed income.

Using only weights to adjudicate on the level of diversification in a portfolio is likely to mislead, as all the building blocks are assumed to contribute a similar level of risk to the portfolio. Indeed, a seemingly "well diversified" portfolio, from the perspective of weights, can still be highly concentrated when viewed through the prism of risk contribution (see Figure 1). **Other possible measures to ascertain the level of diversification in the portfolio include the diversification ratio (see Choueifaty and Coignard (2008))[2] as well as the number of uncorrelated bets (Meucci, Santangelo and Deguest (2015)).[3]**

Figure 1

Illustration of Asset Allocation and Corresponding Portfolio Risk Contribution



Asset Allocation **Asset Risk Contribution**

Source: State Street Global Advisors. For illustrative purposes only.

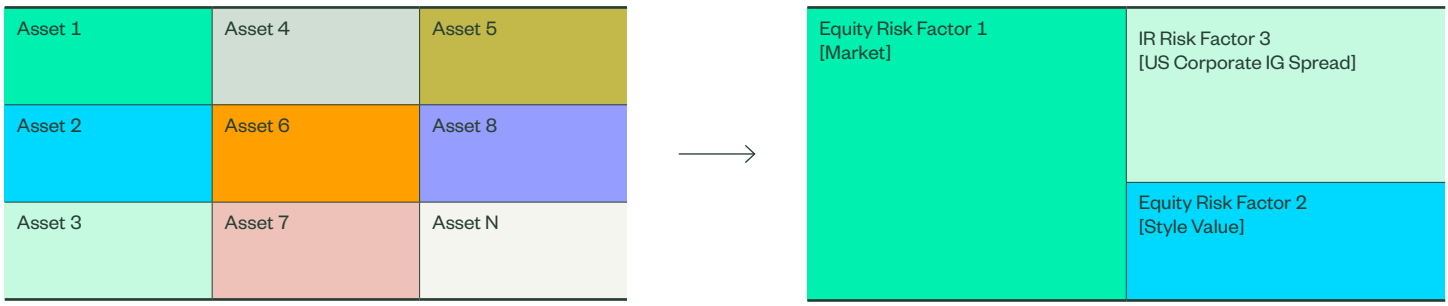
Computing measures — such as risk contribution or the effective number of bets — informs the level of diversification in the portfolio for a given set of pre-selected building blocks. However, while the portfolio may appear well diversified because the risk between the building blocks is now more spread out, it may indeed still be highly concentrated because the building blocks selected for the portfolio are affected by a common set of factors or drivers of risks.

Therefore, it is necessary **to perform a full portfolio risk attribution to understand the sources of risk from a whole gamut of common risk factors (see Figure 2) and how diversified the portfolio really is.** As part of the offering of the SPDR Portfolio Consulting Service, we offer a deep-dive, holdings-based portfolio analysis to examine the common risk drivers in the portfolio.

Only when we have fully understood the underlying return and risk drivers of the portfolio, and reconciled those with our preferences, can we build a truly diversified portfolio that accords with our objectives and preferences. **Attempting to achieve portfolio diversification by investing in a great number of funds is likely to achieve little more than an expensive market beta portfolio.**

Related to the topic of diversification is the idea of conviction. **There could be situations when investors may wish to express a view with conviction over the shorter term, especially in a tactical asset allocation portfolio.** In such an instance, it is important to place a material allocation in the funds that best expresses that conviction. Placing a small, tokenistic allocation into a conviction investment idea is unlikely to influence the overall portfolio performance in any meaningful way. How much of your portfolio should be split into strategic and tactical asset allocation is another debate altogether.

Figure 2
Illustration of Asset Allocation and Corresponding Risk Factor Decomposition



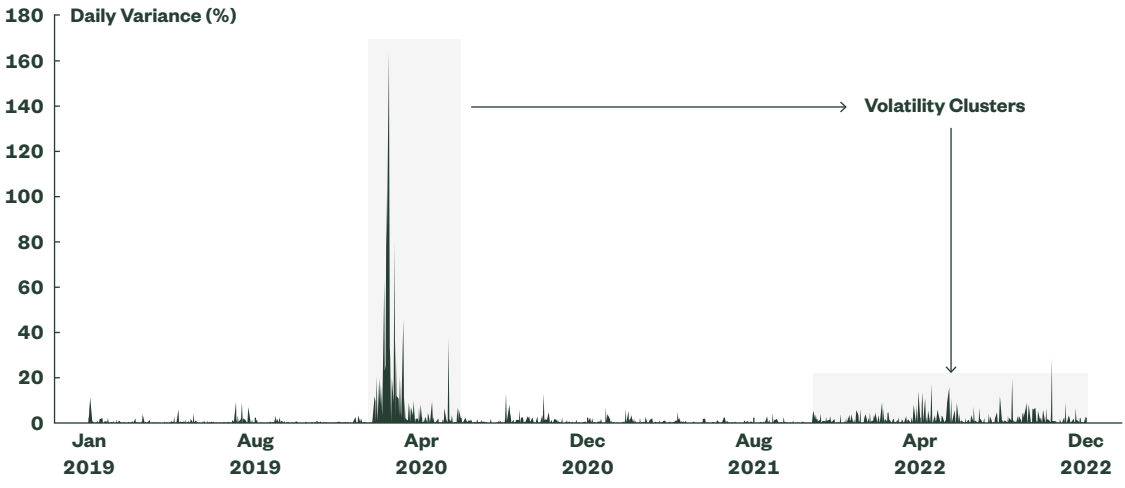
Source: State Street Global Advisors. For illustrative purposes only.

Limits of Expectations and History

An important part of asset allocation for many investors is to form capital market expectations because it is these expectations that often drive allocation decisions. However, forecasting future asset prices or returns with any level of accuracy is difficult. Merton (1980)[4] underscores the difficulty with forming expected returns using a time series of realised return and Greenwood and Schleifer (2014)[5] highlight that investor expectations are generally extrapolated and do not generally predict future returns well. Certainly, we know that the past is not a guarantee of the future and, in light of the studies cited, the question now is whether it is meaningful to examine historical information at all. **According to Ang, Chen and Xing (2004),[6] some insightful information may be gleaned from historical risk numbers.**

There are also drawbacks with using historical information to make inferences about the future. However, there is potentially more information to be derived from realised risk than realised return. The reason for this is that current volatility often has a significant relationship with its own past observations (see Bollerslev, Engle and Wooldridge (1988)).[7] **This phenomenon, known as volatility clustering, is where changes in prices tend to group together, resulting in persistence of the magnitude of price changes (see Figure 3).** On the contrary, no such relationship can be observed for return numbers themselves. Other advantages of using risk-focused frameworks in investment analysis can be extended to diversification of risk as well as downside risk protection (Ang, et al (2006)),[8] thus strengthening the advantage of expected risk over expected return for future economic decisions.

Figure 3
Volatility Clustering for the S&P 500 Index



Source: Yahoo Finance (^GSPC Ticker), data based on daily closing prices between January 2018 and January 2023. For illustrative purposes only.

Having established our preference to glean information from risk rather than return information, the next relevant question is what kind of risk measures should be used. Purely historical (or ex-post) information is only meaningful to describe the past but may not be all that instructive to inform current and future portfolio decisions. For this reason, a more appropriate measure may be to use ex-ante risk measures, estimated from a risk model.

The reason for this is that an **ex-ante risk number uses statistical techniques to generate more up-to-date risk measures**. For instance, the MSCI Barra Model emphasises the most recent observations while still taking into consideration earlier events via exponential weighting. In addition, it is possible to use the risk model to decompose the portfolio in such a way as to allow investors to understand the drivers of risk, particularly what their overall portfolio biases are.

Balancing Multiple Objectives and Constraints

Another common topic we examine is how to balance multiple, and sometimes competing, objectives and constraints for clients in the portfolio construction process. For instance, a common request is to attain a significant level of carbon reductions in the portfolio while maintaining a similar risk profile as the initial portfolio. This kind of balancing act can often be successfully handled with an optimisation process. **However, it is important to bear in mind that optimisation seeks to help achieve a compromise, or a trade-off, and does not necessarily solve all problems.**

For this reason, we advise limiting the number of objectives and constraints in an optimisation and **prioritising them accordingly**. Indeed, if too many constraints and objectives are placed without a sense of priority, then the optimisation may become unstable and may not find a solution that successfully trades off the various requirements that have been specified. Related to this, the sensitivity of the optimisation parameters needs to be tested and their impact assessed to avoid overfitting and lack of performance out of sample. For example, if the optimisation only delivers strong results at a specific maximum cap but the results drastically change when there is a slight modification in the cap, then this may point to "overfitting" and the optimisation may not perform satisfactorily under real market conditions.

Separate from the performance of the optimisation algorithm itself, there are other reasons why the optimiser may produce unstable solutions "out of sample." For instance, the historical return data that is used to estimate the volatility and correlation between the different assets may be noisy and subject to estimation errors. In this context, any asset allocation solution produced from the optimisation may lack robustness and behave unpredictably in real life (i.e. out of sample).

There are ways to improve the stability of optimised solution, which may include "denoising" the covariance matrix via techniques such as Marchenko-Pastur and Ledoit-Wolf. The Machenko-Pastur covariance denoising technique involves separating the observed covariance matrix into a "true" covariance matrix, which is the true "signal," and additive noise, which is assumed to follow a particular statistical distribution. Similarly, the Ledoit-Wolf covariance denoising technique also seeks to decompose the sample covariance matrix into the true covariance matrix and noise but it does so by shrinking the covariance matrix into a structured target matrix, which is chosen based on prior knowledge and assumptions.

In other words, the technique trades off between the observed covariance matrix and the target covariance matrix. Another method of modelling data uncertainty in the optimisation process involves the use of robust optimisation. In any case, each method comes with its own advantages and disadvantages and, whichever method an investor chooses, it is important to acknowledge that taking a small sample of data and using that to produce a solution will inherently lead to an unstable solution that will not perform under real market conditions.

Once we have established that the objectives and constraints are adequately balanced, another topic that needs careful consideration is how we should assess the performance of the portfolio. **In general, portfolios should be judged on a total return basis.** While maximising yield is a reasonable portfolio objective, focusing only on yield may lead to a poorly diversified, and potentially volatile, portfolio. Indeed, relying purely on historical yield alone may result in a bias that has recently exhibited high yields and this bias can lead to chasing past performance without considering the sustainability of the yield or the potential for mean reversion.

Endnotes

1 Willenbrock, Scott (2011). "Diversification Return, Portfolio Rebalancing, and the Commodity Return Puzzle", Financial Analysts Journal, Vol. 67, No. 4, pp. 42–49, July/August.

2 Choueifaty, Y., Coignard, Y. (2008). Toward maximum diversification. The Journal of Portfolio Management, 35(1), 40–51.

3 Meucci, Santangelo, Deguest (2015). Risk Budgeting and Diversification Based on Optimized Uncorrelated Factors, SSRN.

4 Merton, R.C. (1980). On Estimating the Expected Return on the Market: An Exploratory Investigation. *Capital Markets: Asset Pricing & Valuation.*

5 Greenwood, R.M., & Shleifer, A. (2013). Expectations of Returns and Expected Returns. ERN: Expectations in Economic Theory & Markets.

6 Ang, A. et al., Downside Risk (March 3, 2004). AFA 2005 Philadelphia Meetings.

7 Bollerslev, T. et al., A Capital Asset Pricing Model with Time-Varying Covariances. Journal of Political Economy 96 (1988): 116–131.

8 Ang, A. et al, Downside Risk (3 March, 2004). AFA 2005 Philadelphia Meetings.

About State Street Global Advisors

Our clients are the world's governments, institutions and financial advisors. To help them achieve their financial goals we live our guiding principles each and every day:

- Start with rigor
- Build from breadth
- Invest as stewards
- Invent the future

For four decades, these principles have helped us be the quiet power in a tumultuous investing world. Helping millions of people secure their financial futures. This takes each of our employees in 29 offices around the world, and a firm-wide conviction that we can always do it better. As a result, we are the world's fourth-largest asset manager* with US $3.62 trillion† under our care.

* Pensions & Investments Research Center, as of December 31, 2021.
† This figure is presented as of March 31, 2023 and includes approximately $65.03 billion USD of assets with respect to SPDR products for which State Street Global Advisors Funds Distributors, LLC (SSGA FD) acts solely as the marketing agent. SSGA FD and State Street Global Advisors are affiliated. Please note all AUM is unaudited.

ssga.com/etfs

Information Classification: General Access

Marketing communication.
For professional clients use only.

State Street Global Advisors Worldwide Entities

Important Information

Standard & Poor's, S&P and SPDR are registered trademarks of Standard & Poor's Financial Services LLC (S&P); Dow Jones is a registered trademark of Dow Jones Trademark Holdings LLC (Dow Jones); and these trademarks have been licensed for use by S&P Dow Jones Indices LLC (SPDJI) and sublicensed for certain purposes by State Street Corporation. State Street Corporation's financial products are not sponsored, endorsed, sold or promoted by SPDJI, Dow Jones, S&P, their respective affiliates and third party licensors and none of such parties make any representation regarding the advisability of investing in such product(s) nor do they have any liability in relation thereto, including for any errors, omissions, or interruptions of any index.

Past performance is not a reliable indicator of future performance.

Investing involves risk including the risk of loss of principal.

All information is from SSGA unless otherwise noted and has been obtained from sources believed to be reliable, but its accuracy is not guaranteed. There is no representation or warranty as to the current accuracy, reliability or completeness of, nor liability for, decisions based on such information and it should not be relied on as such.

The information provided does not constitute investment advice as such term is defined under the Markets in Financial Instruments Directive (2014/65/EU) or applicable Swiss regulation and it should not be relied on as such. It should not be considered a solicitation to buy or an offer to sell any investment. It does not take into account any investor's or potential investor's particular investment objectives, strategies, tax status, risk appetite or investment horizon. If you require investment advice you should consult your tax and financial or other professional advisor.

This communication is directed at professional clients (this includes eligible counterparties as defined by the appropriate EU regulator) who are deemed both knowledgeable and experienced in matters relating to investments. The products and services to which this communication relates are only available to such persons and persons of any other description (including retail clients) should not rely on this communication.

Bonds generally present less short-term risk and volatility than stocks, but contain interest rate risk (as interest rates raise, bond prices usually fall); issuer default risk; issuer credit risk; liquidity risk; and inflation risk. These effects are usually pronounced for longer-term securities. Any fixed income security sold or redeemed prior to maturity may be subject to a substantial gain or loss.

The returns on a portfolio of securities which exclude companies that do not meet the portfolio's specified ESG criteria may trail the returns on a portfolio of securities which include such companies. A portfolio's ESG criteria may result in the portfolio investing in industry sectors or securities which underperform the market as a whole.

This document contains certain statements that may be deemed forward looking statements. Please note that any such statements are not guarantees of any future performance and actual results or developments may differ materially from those projected.

Issuing Office: This document has been issued by State Street Global Advisors Europe Limited ("SSGAEL"), regulated by the Central Bank of Ireland. Registered office address 78 Sir John Rogerson's Quay, Dublin 2. Registered number 49934. T: +353 (0)1 776 3000. F: +353 (0)1 776 3300. Web: ssga.com.

The views expressed in this material are the views of SPDR EMEA Quantitative Research through the period ending 12 June 2023 and are subject to change based on market and other conditions. This document contains certain statements that may be deemed forward-looking statements. Please note that any such statements are not guarantees of any future performance and actual results or developments may differ materially from those projected.

Equity securities may fluctuate in value and can decline significantly in response to the activities of individual companies and general market and economic conditions.

The information contained in this communication is not a research recommendation or 'investment research' and is classified as a 'Marketing Communication' in accordance with the Markets in Financial Instruments Directive (2014/65/EU). This means that this marketing communication (a) has not been prepared in accordance with legal requirements designed to promote the independence of investment research (b) is not subject to any prohibition on dealing ahead of the dissemination of investment research.

ID1617700-5722603.2.1.GBL.INST 0623
Exp. Date: 30/06/2024