

Multiplying your wealth by dividing it

The how and why of diversification

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IN BRIEF

- The benefits of diversification are powerful and intuitive. Traditional passive investing, using capitalization-weighted indices, can fail to diversify—often quite dramatically.
- Adopting a truly passive view requires avoiding taking concentrated bets on risk factors just because the “market portfolio” takes those bets. Unintentional concentrations in regional-, sector- or security-specific risks can be easily mitigated without sophisticated risk models.
- There are a number of ways to build diversified portfolios. The more complex the method, the greater the knowledge of the future that it implies. We favour simplicity instead, minimizing the sensitivity and fragility of models by reducing the number of parameters.
- Rethinking indexation to improve risk-adjusted returns through diversification is a useful tool, but it has, to date, been somewhat neglected in strategic beta index construction.

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WHY DIVERSIFY?

“Divide your means seven ways, or even eight, for you do not know what disaster may happen”
– *Ecclesiastes 11:2, New Revised Standard Version*

The concept of diversification is not new—indeed, as the quote above reminds us, it has been around for thousands of years—and its benefits are clear and intuitive. Why do we diversify? Because it reduces risk.

Investing in a single security means being subject to its full volatility and return profile. Because securities are not perfectly correlated (some go up while others go down), investing in many securities, diversifying one’s holdings, means the overall volatility of the portfolio comes down.

This is the thinking behind the traditional equity index fund: Diversify holdings across a number of different stocks, sectors and even regions, and the result is a broad exposure to the equity market, with less volatility than a more concentrated portfolio, in a pre-packaged and inexpensive product.

Diversification also has the benefit of addressing uncertainty. If we are not confident that one stock will outperform the others, we would do better to spread out our holdings across a broad basket. While forecasting asset returns is difficult and requires skill, diversification is easy and can actually be achieved using very simple models.

Are all indices diversified?

An intuitive interpretation of diversification—the more stocks you hold, the more diversified you are—suggests that all index funds must by definition be well diversified. But in reality, passive investors are exposed to more risk concentration than they might expect.

That is because this intuitive interpretation of diversification fails to acknowledge the shared risks among stocks. If stocks were perfectly uncorrelated, each addition to an index would improve the diversification to an equal extent. But not all of a stock’s risk comes from its own inherent, or “idiosyncratic,” risks. In fact, most of the risk is shared across securities.

What is a factor?

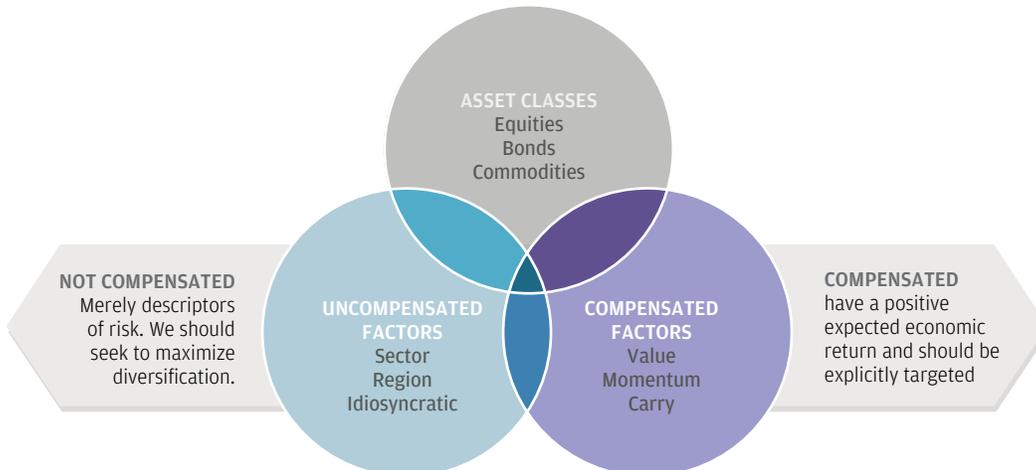
We use the term “factors” to describe these shared risks. Factors are the characteristics that describe the return distribution for a group of securities or financial instruments. Put another way, a factor is a description of risk that can explain the similarities in securities’ returns. Investors can utilize factors to clarify a portfolio’s sources of risk and return.

Factors have a well-established pedigree in the history of finance. Indeed, the majority of returns for all stocks can be explained by a single, widely known and accepted factor: market risk.¹ Investors accept the risk of equity markets in return for a premium that accrues over the long term.

¹ Fama, E., & French, K. (1993). “Common risk factors in the returns on stocks and bonds.” *Journal of Financial Economics* 33(1), 3-56.

Factors may be either compensated or uncompensated. Asset classes often have associated compensated factors (e.g., equity has the market risk premium, sovereign debt has the term premium) but may not have economically justified, positive expected real returns (e.g., commodities, whose returns depend largely on inflation).

EXHIBIT 1: TAXONOMY OF FACTORS



Source: J.P. Morgan Asset Management. For illustrative purposes only.

THE MATHEMATICS OF DIVERSIFICATION

Assets diversify a portfolio when the source of their respective returns diverge and correlate less than perfectly. The formula for variance in a portfolio of two assets quantifies the diversification benefit:

$$\text{Total portfolio variance} = (w_1\sigma_1 + w_2\sigma_2)^2 - \overbrace{(1 - \rho)2w_1w_2\sigma_1\sigma_2}^{\text{diversification benefit}}$$

where w = weight, σ = standard deviation and ρ = correlation.

A key determinant of the impact of diversification is the correlation (ρ , the correlation between two assets, in the above formula).

While we might like to determine correlations mathematically, the markets are far too dynamic and messy for us to deduce precise, real-time correlations between every pair of assets in a portfolio. Factor models, however, allow us to impose a structure on correlations, identifying where we think they will be higher and lower, and can be a simpler but equally effective portfolio construction tool.

The capital asset pricing model tells us that there is a single source of shared risk, the market risk factor, and that all remaining risks are idiosyncratic. In fact, there are other common risks besides market risk—the aforementioned factors. These similarities could derive from a common investment style (like stocks with cheaper valuations) or something more specific (such as the similar performance of stocks in the energy sector).

Grouping securities by factors gives us a simple construct to look at what is driving a portfolio’s risk and return. Intuitively, two energy companies, for instance, are more closely related than an energy company and a consumer goods company, and therefore a portfolio comprising an energy company and a consumer goods company will be more diversified than one comprising two energy companies.

Factors can be divided into compensated premia and uncompensated risks (EXHIBIT 1). Sometimes, over the long term, investors earn a positive economic return from taking on risk (for example, the positive return earned from equity market beta). In this case, we consider these factors to be compensated. In other cases, factors are merely descriptions of common risks; those we consider uncompensated risks. Faced with uncompensated risks, investors should diversify as much as possible. Compensated premia are rare,² and any claim to the existence of new ones should be viewed with skepticism. To admit a new premium into the pantheon requires a strong economic rationale for its existence, along with strong empirical evidence of its persistence over a range of market and economic environments.

You’re not as diversified as you think you are

There are a number of ways to identify shared risk, and the list is steadily growing as academics and industry practitioners add to the body of research. Models may be constructed by dividing the universe into economically meaningful categories³ or by

employing sophisticated methods.⁴ The former tends to be more readily interpretable and less prone to estimation error, though it is more likely to be subject to behavioural bias. Both can be used successfully to build diversified portfolios, but we view simplicity as a strength and hence prefer the category-driven approach.⁵

The challenge of this approach is to identify the relevant dimensions over which we should consider diversification. Three candidates have long served as the basis of portfolio construction for active management and manager due diligence:

- Sector- (or industry-) specific risk
- Region- (or country-) specific risk
- Single-stock idiosyncratic risk

Judging a capitalization-weighted index’s risk breakdown along these lines can reveal some quite surprising risk concentrations. The most startling numbers occur during what, with hindsight, were obvious bubble scenarios—for example, EXHIBIT 2 shows that in July 2000, technology stocks accounted for almost half of the risk in the S&P 500.

That said, these concentrations are present across many market cycles. As of September 30, 2017, tech companies represented 18% of the risk of the S&P 500. That is not to say that the tech sector is overvalued per se, but for investors with no active view, too much of their investment performance will be attributable to the prospects of 50 hardware and software companies—10% of the index.

² For a more detailed description of non-market premia, see Staines, J., & Romahi, Y. (2016). “Inside the black box: Revealing the alternative beta in hedge fund returns.” *J.P. Morgan Asset Management Portfolio Insights*.
³ For example, through the sorts in Fama, E., & French, K. (op. cit.)

⁴ For example, through principal component analysis; see Laloux, L., Cizeau, P., Bouchaud, J.-P., & Potters, M. (1999). “Noise dressing of financial correlation matrices.” *Physical Review Letters* 83, 1467-147.
⁵ Staines, J., Li, V. & Romahi, Y. (2016). “Dimensions of diversification.” *The Journal of Index Investing*, 7(2), pp. 119-127.

Outside of frothy market conditions, concentrated risk contributions can be less extreme but still present. As of September 30, 2017, the financial sector made up 18% of the risk of the S&P 500 index.

EXHIBIT 2: CONCENTRATED RISK CONTRIBUTIONS FROM SECTORS OF THE S&P 500 INDEX DURING THE TECH BUBBLE, AND A RISK-BALANCED PORTFOLIO, PRESENTED FOR ILLUSTRATIVE PURPOSES ONLY



Source: J.P. Morgan Asset Management. For illustrative purposes only.

Diversification can be simple

At this juncture, we consider principles of diversification that are not factor specific. To build a portfolio that is truly diversified—a risk-based portfolio—there are two different approaches to portfolio construction, on opposite ends of the spectrum. We present these two approaches in **EXHIBIT 3**:

Optimized: If we have a highly certain view of how assets will perform, we can use this information to optimize our allocation.

- The most complex optimization methods, however, demand that we predict aspects of the distribution of asset returns. This may lie beyond our ability to forecast, as unforeseen events can affect the risk an asset presents and the way assets move relative to one another.

Risk-balanced: If we are not highly certain of the outcome, we can simply diversify.

- Since we have imperfect foresight, we could apply a simpler method and minimize the potential impact of incorrect predictions. In the most extreme example of the risk-balanced approach, if we knew nothing about the assets in which we were investing, we might simply allocate an equal portion to each.

But there are choices beyond these two extremes. Indeed, there is a spectrum of methods for constructing a portfolio, ranging

from the most sophisticated (and hence the most dependent on forecasts) to the simplest and most robust. Exhibit 3 shows this spectrum, ranging from the highest fidelity on the left to the most robust on the right. Most portfolio construction techniques, in practice, attempt to balance these two extremes.

One method of portfolio construction that falls along this spectrum is known as equal risk contribution. This method moves a step toward simplicity by avoiding return predictions, and so requires fewer input assumptions than mean-variance optimization. Yet equal risk contribution still requires predicting the full correlation matrix of asset returns.⁷ These can swing dangerously and lead portfolio optimizers to concentrate risk based on erroneous assumptions.

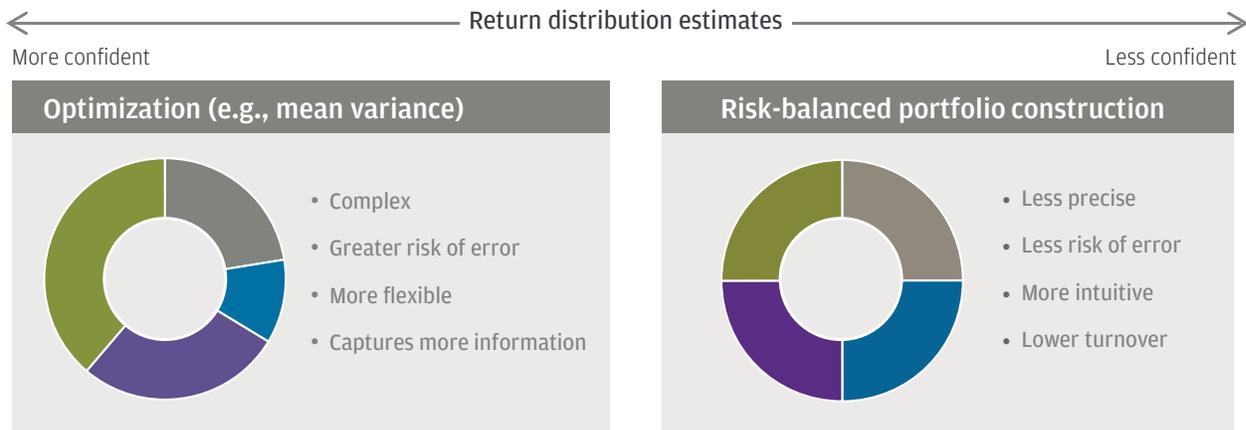
In our factor-based portfolios, our preferred portfolio construction method involves a simple categorical type of diversification, in which the stand-alone risk of each category of assets is taken into account. This allows us to build a well-diversified portfolio capable of achieving the same outcome as optimization approaches,⁸ while limiting the reliance on input assumptions.

⁷ Correlation matrix: The relationship between each pair of stocks; for the Russell 1000, that means predicting almost half a million different relationships! For further discussion, see Maillard, S., Roncalli, T., & Teiletche, J. (2010). "The properties of equally weighted risk contribution portfolios." *The Journal of Portfolio Management* 36(4) pp. 60-70.

⁸ Staines, J., Li, V. & Romahi, Y. (op. cit.)

If investors can determine with certainty the distribution of asset returns, they can use an optimizer to find the best portfolio for them. However, typically there is significant uncertainty about the parameters of this distribution. More robust methods, such as risk-based portfolio construction, help increase the likelihood of achieving goals in practice, rather than just in theory, and of protecting against the impact of estimation error.

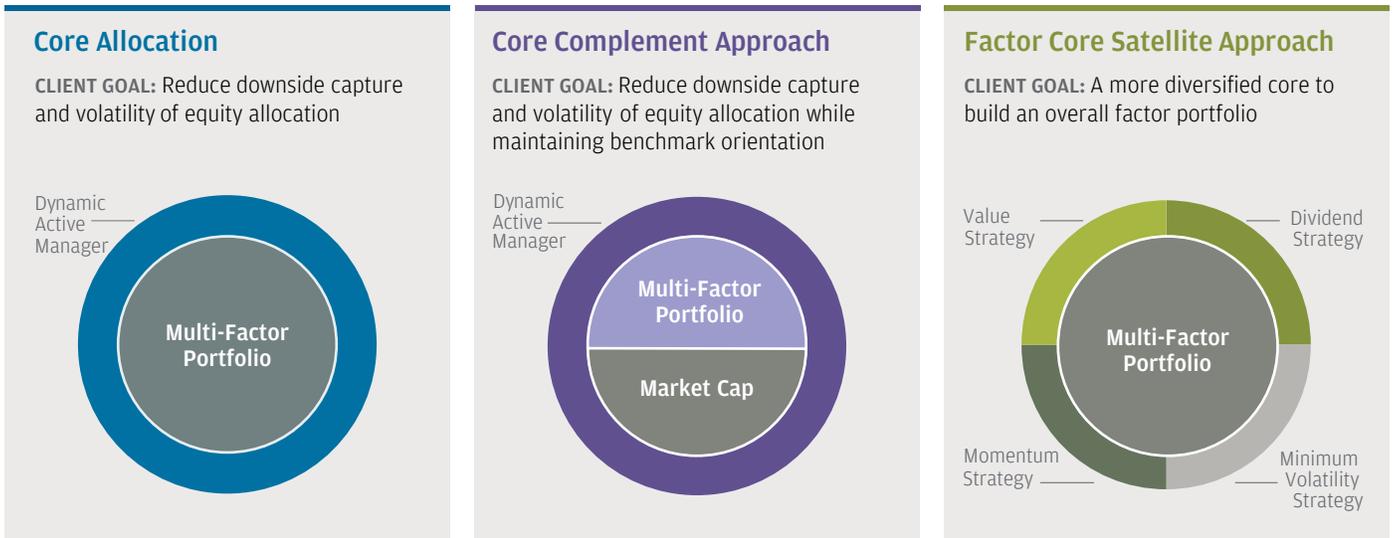
EXHIBIT 3: ON OPPOSITE ENDS OF THE SPECTRUM, TWO DIFFERENT APPROACHES TO CONSTRUCTING A DIVERSIFIED PORTFOLIO



Source: J.P. Morgan Asset Management. For illustrative purposes only.

Risk-based portfolios can add value as a complement to a traditional market capitalization-weighted portfolio

EXHIBIT 4: DIFFERENT APPROACHES TO PORTFOLIO CONSTRUCTION WITH RISK-BALANCED FUNDS



Source: J.P. Morgan Asset Management. For illustrative purposes only.

Critically, volatility parity avoids trying to predict correlations between assets (or factors). Instead, it measures the difference in risk between assets by using their relative levels of historical volatility. This takes advantage of the fact that while realized volatility can move up and down, over the long run the most volatile assets will remain more volatile.

Using risk-balanced funds in a portfolio

Because a traditional capitalization-weighted index fund may expose passive investors to unexpected risk concentrations, they may want to consider using a risk-balanced portfolio as a core equity holding. An indexing strategy that is diversified along factor lines can lead to more controlled drawdowns—or steadier and less volatile growth—than a capitalization-weighted approach. Meanwhile, it mitigates the concentrated bets on risk factors that the “market portfolio” takes.

One issue that may give some investors pause is tracking error—i.e., deviation from the benchmark index. A risk-based portfolio—whether it is risk-balanced as we advocate or diversified by some other methodology—may exhibit some deviation from the capitalization-weighted benchmark for the same asset class. Since the risk-based portfolio is designed to be more disciplined in its exposures, the tracking error can vary widely.

Investors with a more explicitly benchmark-aware risk budget might see such portfolios as carrying too much active risk. We would argue, however, that it is the *benchmark’s* concentration that represents the true source of risk. The greater the concentration of risk in the benchmark, the greater the risk-balanced portfolio’s tracking error—and not because a risk-balanced portfolio is getting riskier. Quite the opposite: Frothy markets must be taking the benchmark further from a disciplined risk-balanced position.

Nonetheless, some investors are forced, by policy or mandate, to view the market cap benchmark as their starting point. In those cases, risk-based portfolios can still add value, possibly as a complement to a traditional market capitalization-weighted portfolio. **EXHIBIT 4** shows two examples of such risk-based portfolios, which we refer to as core complement and core satellite approaches.

Investor objectives and constraints will vary, and there are as many ways to incorporate risk-balanced funds as there are types of investor. Whatever the intentions for the portfolio, the dimensions of diversification cannot be ignored. Effective diversification across all of these dimensions is far from guaranteed in capitalization-weighted benchmarks, historically seen as the epitome of diversified investing. Thus, investors must look deeper if they wish to multiply their wealth by dividing it.

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