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Diversification: managing eggs and baskets

Key take aways

- Diversification can reduce the risk of losses of your portfolio.
- Diversification is not just about including as many assets or asset classes as possible. It is about investing in portfolio components that behave differently.
- Investing in different assets is not an "either/or" choice. It is the allocation that matters.
- One should be careful not to overestimate the benefits from diversification.

01 Executive summary

Diversification means mixing a variety of investments within a portfolio. It is a technique aiming to reduce the risk of losses of your portfolio by investing across a range of assets with different market behaviour – such as asset classes, companies, industries, countries, amongst others.

Unfortunately, you never know with certainty the future performance of an investment. There are simply too many unknown and potentially relevant factors influencing the market. So while the current price of an investment may reflect our current knowledge of its future prospects, this knowledge will likely not be accurate. It is possible to derive knowledge about opportunities and risks over time only.

At first glance, the underlying idea of diversification is very simple. Diversification avoids "putting all your eggs in one basket" in order to minimize the negative consequences of uncertainty. In general, risks should be spread effectively by targeting assets evolving in opposite directions – so that the chosen "mix" of assets is able to compensate for losses and gains at the same time. Hence, through appropriate diversification the risk of loss or volatility can be decreased for a given expected return. Or in other words, the expected return can be increased for a given risk.

However, you do not know the exact future diversification impact on your portfolio either. Hence, the aim should always be to create portfolios that provide a reasonable balance between robustness (i.e. resilience to an uncertain future) and efficiency (i.e. maximization of the expected return for a given risk). Robustness can be improved by individually assessing the uncertainty not only of the expected returns but also of the diversification impact of each investment and, importantly, by not trying to over-optimize portfolios – it may be worth aiming for a performance slightly lower that what looks efficient based on current expectations, if this leads to a more stable and predictable outcome.

Hence, using diversification is key but doing it properly is not a trivial undertaking.

02 Managing risk

Diversification means mixing a variety of investments within a portfolio. It is a technique aiming to reduce the market risk, i.e. the likelihood of future losses or volatility of your portfolio value by investing across a range of assets with different market behaviour – such as asset classes (see Figure 1), companies, industries, countries, amongst others – through scattering risk and chances.

But how can diversification be implemented and how exactly does it work? At first glance, the underlying idea is very simple. Diversification avoids "putting all your eggs in one basket" in order to minimize the risk (i.e. the variance of the return of the portfolio) resulting from uncertainty. It becomes more unlikely that all single investments in the portfolio will show poor performance and there is good chance that some investments show a positive performance that can compensate part of the losses of other investments. Hence, through appropriate diversification across the entire investment portfolio, the risks around an expected return can be decreased or, in other words, the return for a given risk level can be increased.

03 Future uncertainty

Diversification can create its own risks. As early as 1938, John Maynard Keynes noted that "to carry one's eggs in a great number of baskets, without having time or opportunity to discover how many [baskets] have holes in the bottom, is the surest way of increasing risk and loss". In other words, diversification can promote a false sense of protection, if it stops you looking at the risks around every component of your portfolio.

Does this mean that diversification does not help and can even be neglected? No. In reality, inherent uncertainty about the future means that we can never fully identify the "holes" that Keynes refers to – but this does not mean we should put all our investment in one "basket". Diversity is necessary because of uncertainty, not despite it.

Much of recent investment thinking has been based around the "efficient markets hypothesis" – the idea that the current price of an investment reflects all our knowledge about its future performance. This idea was first formally stated in the mid-1960s – long after Keynes's statement – but the concept goes back much earlier. However, even this idea does not mean that you know with certainty the future performance of an investment. There are simply too many unknown and relevant factors influencing the market. So while the current price of an investment may reflect our current knowledge of its future prospects, this knowledge will likely not be accurate. Therefore, it is possible only to a limited extent to derive knowledge about opportunities and risks over time. Hence, diversification is anything but trivial.

04 Diversification in theory

Given all this, how should one therefore approach the problem of diversification?

The simplest approach – which involves an implicit assumption that we know nothing about the future – is a naïve diversification. An investor invests the same share in different assets.

A belief remains that our knowledge of asset class' past behaviour can be used to create a more sophisticated approach. This idea was pioneered by Harry Markowitz in 1952 and is often referred to as Modern Portfolio Theory.

Markowitz's idea was to quantify the diversification effect via the estimation of the covariance (mathematically: the covariance is a measure that defines the degree and size of co-movement between two assets) of past returns between the assets. A negative covariance means asset prices generally move in opposite directions; a positive covariance means that they move in step. This represents a significant step forward from a pure qualitative approach which aims to provide a recommendation about how to allocate the "eggs" between the "baskets".

There are, however, a number of technical as well as conceptual difficulties with this approach.

First, this methodology depends on knowing the correlations/relations between asset classes. We have a number of statistical measures at our service which essentially pose two sets of questions:

1. Are we talking about a correlation just between a pair of variables – or multiple variables? (In technical terms, a pair vs. higher order correlation.)
2. Is the correlation just linear (straight line) or can it change? (linear vs. non-linear correlation)

In general, when you talk about dependencies, a lot can go wrong – including their computation and their interpretation.

It should be noted that the ability to observe a correlation depends on the distribution of the data and the number of data points for the respective asset classes as well. Several issues are immediately apparent:

Number of data points may not be sufficient. For example, if you are observing a correlation around zero, more data is required in order to achieve a better validity because this statistical value could show the same or opposite relationship between asset classes.

Different-looking distributions can conceal similar underlying measures. At the same time, the distribution of the data points can be different, but the mean, standard deviation and correlation can still be the same. In other words, do not make false comparisons.

Stable relationships are not guaranteed. Correlations measure a linear relationship for stationary variables – in other words, one that is assumed to be constant over time. In practice, this "stationarity" cannot always be achieved and the relationship may not be stable over time – especially during global market events (e.g. GFC and SARS-CoV-2). In this way, correlations may sometimes be stronger and sometimes weaker.

This brings us to a significant problem in that the relationship between two assets is not an "either/or" situation. Consider a situation where a shop is selling both umbrellas against the rain and parasols against the sun. It is quite possible that umbrellas will continue to be sold despite sunny weather or that the sale of parasols will decrease due to a lack of buyers even during sunny days, so that a pure distinction between two assets may not exist.

05 Diversification in practice

Costs: To start with a simple but important point: "blind diversification" can be harmful if the marginal loss of expected return is greater than the marginal benefit of reduced risk – and one common cause of this is having a lot of baskets that can increase opportunity costs.

Unexpected outcomes: Figure 2 (overleaf) shows the S&P 500 (total return) Index, the U.S. 10 year Treasury Bond (total return) Index and a naïve combination of both indices for different time periods (with the same length) starting in 1980. This simple illustration already provides interesting discussion points considering Figure 3 (also overleaf):

1. Diversification can significantly reduce portfolio volatility and thus possibly the risk of loss while only slightly reducing performance.
2. A higher portfolio performance is possible while keeping the same risk.
3. The relationship between two assets is not stable: correlation seemed to change over time.

The naïve diversification reveals a 2% lower relative performance compared to a full investment into the S&P 500 in the period 1980-1990, but exhibits a much lower volatility (-34%) despite a positive correlation between the S&P 500 and U.S. Treasury bonds in this particular time period. Figure 3 shows that although diversification benefit is unstable, the ratio of return over volatility seems to improve. Every period is different and it is possible of course to have different outcome. The report "SAA key topics: market timing" we published in February offers you further details.

This example shows why factoring in uncertainty is important. One important observation is that bond holdings should provide some diversification benefits, given likely yield moves in stress scenarios. But the argument for bonds is broader than this: our simple calculations suggest that the weighted average return on a portfolio including bonds can possibly be better than one with just an allocation to equity.

Another point which may seem counterintuitive is that diversification may even allow a higher investment in riskier assets, thus with higher return potential, than initially intended without affecting your overall portfolio risk. Diversification opens up to more opportunities.

There is a need for both efficiency and robustness in portfolio diversification (see our special report "SAA robustness: what it means").

In our view, achieving robustness means taking a critical view of not only the expected returns but any volatilities and correlations used in diversification as well. Some volatilities and correlations are more stable than others. Hence, our Strategic Asset Allocation (SAA) uses individual broad assumptions about the uncertainty of all relevant future market parameters including the individual volatilities and correlations.

Our objective is to create a portfolio with a structure which can remain intact by maintaining its risk-return characteristics, even with unpredictable correlations.

In terms of efficiency, the choice of financial instrument can have wide-ranging effects. Our SAA approach makes use of exchange traded funds (ETFs) to diversify across the full range of major global markets and asset classes. By using ETFs and/or index based solutions, investors can access efficiency and broad diversification on a global scale.

06 Conclusion

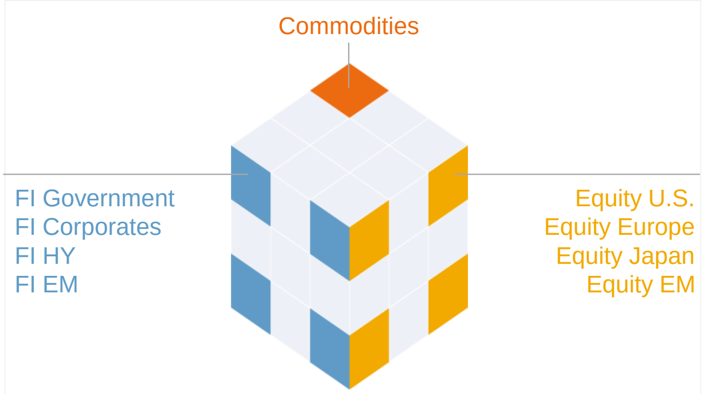
Diversification is the foundation of portfolio construction, but one should be careful not to overestimate what it can do – and also be aware of the difficulties of quantifying its effects.

A single diversification number cannot be taken as a given. Instead, it is critical to assess – and keep assessing – the uncertainty of the correlations themselves.

Your aim should be to have a robust portfolio (resilient to an uncertain future) which is also efficient. Robustness can be improved by including the uncertainty of the diversification impact of each asset and, importantly, not trying to over-optimise portfolios – it may be worth aiming for a performance slightly lower that what is theoretically expected as efficient. It may bring you a more stable and predictable outcome.

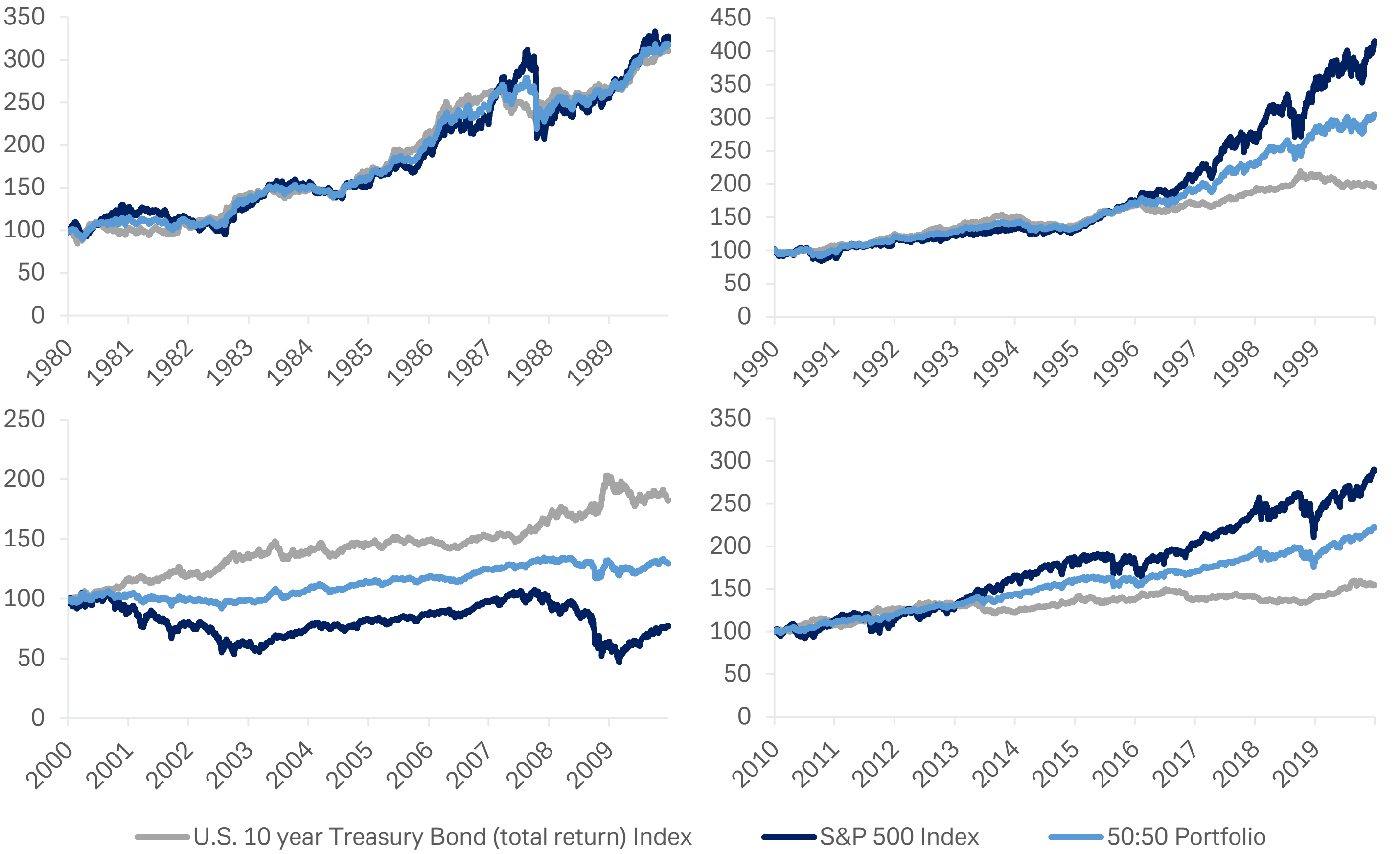
In summary, diversification might appear a simple concept, but is in reality complex. A well-thought-through solution will help you taking advantage of it. Our SAA process incorporates varying degrees of certainty around future asset class relationships – making portfolios more robust against possible future events.

Figure 1: Asset and sub-asset classes



Source: Deutsche Bank AG. As of November 13, 2020. Exemplary selection of possible asset classes.

Figure 2: Portfolio compositions for different time periods



Source: Datastream, Deutsche Bank AG. As of November 16, 2020. The rebalancing takes place every 10 years and the price indexes (y-axis) are normalized to 100 for each time period.

Figure 3: Performance vs. volatility

	1980-1990			1990-2000			2000-2010			2010-2020		
	PERF	VOLA	CORR	PERF	VOLA	CORR	PERF	VOLA	CORR	PERF	VOLA	CORR
U.S. Treasury Bond (total return) Index	12%	10.5%	29%	7%	6.7%	32%	3%	7.8%	-30%	4.8%	6.6%	-46%
S&P 500 Index	12.6%	17.1%		15.3%	14%		-1.3%	19.6%		7%	14.1%	
50:50 mix	12.3%	11.3%		11.8%	9.2%		1.3%	7.2%		6%	6.9%	
Relative Change	-2%	-34%		-23%	-34%		198%	-63%		-14%	-51%	

Source: Datastream, Deutsche Bank AG. As of November 16, 2020. The performance (PERF) and the volatility (VOLA) are calculated per annum. The correlation (CORR) is calculated for every respective time period.

Glossary

Correlation is a statistical measure of how two securities (or other variables) move in relation to each other.

Covariance is a measure of the joint variability of two random variables, e.g. the returns of two assets.

Diversification refers to the dispersal of investments across asset types, geographies and so on with the aim of reducing risk or boosting risk-adjusted returns.

Exchange Traded Funds (ETFs) are investment funds traded on stock exchanges.

The S&P 500 Index includes 500 leading U.S. companies capturing approximately 80% coverage of available U.S. market capitalization.

A strategic asset allocation process involves setting preferred allocations for asset classes on a medium to long-term horizon.

Treasuries are bonds issued by the U.S. government.

The U.S. Treasury Bond (total return) Index is a market-value weighted index measuring the performance of the broad U.S. Treasury Bond market.

Volatility is the degree of variation of an asset class or a trading-price series over time.

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