# Diversification and Insurance: Which Should Come First?

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*'Diversification before insurance tends to perform better than insurance before diversification in the long run... but there are exceptions to this finding,' according to four analysts at Rand Merchant Bank and EDHEC-Risk Institute. This article is excerpted from a larger article in the Spring 2021 issue of EDHEC Research Insights.*

*To see the complete text of this article, click **here**. To visit the 'Retirement Investing' page at EDHEC-Risk Institute, click **here**. The authors are Nicole Beevers, Hannes Du Plessis, Lionel Martellini, and Vincent Milhau.*

**MODERN PORTFOLIO THEORY** suggests that the complex problem of investor welfare maximization subject to various constraints is best handled by jointly using three forms of risk management. First, *diversification* aims to harvest risk premia across and within asset classes with the lowest possible amount of risk and leads to the construction of well diversified performance-seeking portfolios (PSPs). Second, *hedging* aims to immunize a portfolio against certain risk factors and leads to hedging portfolios, including liability-hedging portfolios in asset-liability management, and goal-hedging portfolios in goal-based investing. It completes diversification in that it takes care of systematic risk factors, the exposures to which cannot be neutralized by diversifying a portfolio, while idiosyncratic risk is eliminated by diversification. Finally, *insurance* is captured via a dynamic allocation between a PSP and a hedging portfolio designed to secure an essential goal that can be the protection of a minimum amount of wealth or, more generally, the protection of a minimum amount of wealth relative to a benchmark.

Fund separation theorems from dynamic portfolio theory (see, eg, the seminal paper by Merton [1973] and Martellini and Milhau [2012] for the incorporation of minimum funding requirements) show that the investment strategy that maximizes an investor's welfare uses all three techniques.

This discussion raises the following question: if diversification and insurance (ie, dynamic

hedging) are not mutually exclusive techniques, is there an optimal order for them to be performed? Put differently, is it better to diversify a portfolio of insured payoffs or to insure a diversified portfolio? Since insurance has an opportunity cost, which takes the form of a limited participation in the upside of the PSP in favorable scenarios, compensating for the downside protection in unfavorable scenarios, and since diversification has no cost, intuition suggests that it should be more efficient to costlessly diversify away unrewarded risk before insuring the resulting portfolio at a cost. This lower opportunity cost is reflected in the lower price of the put option that protects against downside risk if the volatility of the underlying asset has been reduced first by diversification.

Several theoretical optimality results show that under certain assumptions, diversification should indeed come before insurance. El Karoui, Jeanblanc and Lacoste (2005) show that an investor who maximizes expected utility from future wealth with constant risk aversion and imposes a minimum wealth constraint should implement an extended form of option-based portfolio insurance (OBPI), where the underlying asset of the option is the portfolio that would be optimal in the absence of the constraint.

The latter portfolio is diversified because the expected utility criterion favors returns but penalizes risk, but it involves the expected returns and covariances of constituents and the risk aversion parameter (Merton [1973]). When the objective is to maximize the probability of reaching a target wealth level while respecting a floor, Föllmer and Leukert (1999) and Deguest et al (2015) establish that it is optimal to hold a knockout option that pays either the floor or the target, whose underlying asset is the 'growth-optimal portfolio,' that is the portfolio that maximizes the expected logarithmic return.

These theorems are obtained in a stylized framework where continuous trading, leverage and short sales are allowed, all risk and return parameters are perfectly known and the criterion is expected utility or the success probability. In practice, it can be argued that since crashes and recoveries in risky assets are not perfectly synchronized, it might be worthwhile to have an asset-by-asset control of the amount of risk-free asset to be invested in – and this would be done by applying insurance first.

In this context, this paper considers whether the question of which should come first, diversification or insurance, subsists in a context closer to real-world investment conditions than the theoretical environment in which the theoretical results are derived. We consider various diversification methods often used in practice, which avoid the estimation of expected returns and risk aversion. These are equal weighting, variance minimisation, risk parity (Maillard, Roncalli and Teiletche [2010]) and maximum diversification (Choueifaty

and Coignard [2008]).

As far as insurance strategies are concerned, we test both constant proportion portfolio insurance (CPPI) and option-based portfolio insurance (OBPI), and we report several standard performance and risk metrics to compare the properties of the 'diversification first' and 'insurance first' approaches. A non-trivial methodological issue that arises in our study is how to construct a diversified portfolio of insured payoffs, given that the usual diversification methods require a covariance matrix estimate. We propose two estimators, both of which are consistent with the returns on the original securities, and one of which takes into account the composition of the insured portfolio.

Our results show that it matters whether insurance or diversification comes first. The big picture is that diversification before insurance tends to perform better than insurance before diversification in the long run, thereby confirming the aforementioned intuition about reducing the opportunity cost, but there are exceptions to this finding, since an equally weighted portfolio of CPPI-like payoffs outperforms a CPPI portfolio based on an equally weighted portfolio. Ultimately it seems that no one approach unambiguously prevails over the other, with respect to whether diversification or insurance should come first.

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