

# DIVERSIFICATION DASHBOARD

March 2020

## Diversification Ratios<sup>®</sup>

<p>TOBAM's Diversification Ratio<sup>®</sup> (DR) measures to what extent a portfolio is diversified. The DR<sup>2</sup> (square of the diversification ratio) measures the number of independent sources of risk to which a portfolio is exposed. As the table shows, the "broad market" indices do not fully utilise diversification capabilities. In addition to a snapshot of each market's DR<sup>2</sup>, the table shows the DR<sup>2</sup> of a well-diversified portfolio, and the fraction of available diversification used by the index.</p>	Universes	DR <sup>2</sup> Benchmark	DR <sup>2</sup> Anti-Benchmark <sup>®</sup>	% diversification captured by benchmark
	MSCI All Countries World	3.45	10.80	31.9%
	MSCI World	3.18	9.88	32.2%
	MSCI World ex USA	3.70	9.76	37.9%
	MSCI Emerging Markets	3.76	8.83	42.6%
	MSCI USA	2.77	7.52	36.9%
	MSCI Pacific Ex-Japan	3.16	6.28	50.3%
	MSCI Euro	2.74	6.22	44.0%
	MSCI Switzerland	2.12	5.71	37.2%
	MSCI Japan	2.90	5.32	54.4%
	MSCI UK	3.08	4.33	71.0%
	ICE BofA ML Global Corporate	3.98	5.43	73.4%
	ICE BofA ML Global High Yield	5.46	7.10	76.9%
	Multi-Asset Universe (MSCI ACWI + ICE BofAML Global Corporate)	5.36	22.57	23.7%

Source: TOBAM, figures as of February 29, 2020

## Multi-Asset: Is Diversification that easy?

Investors holding a multi-asset portfolio are certain of one thing: they will have regrets. One of their asset classes is going to outperform the others, and their own portfolio as a consequence. They accept it because it makes sense to "not put all eggs in one basket" given the uncertainty of what is going to be the best performing asset. Historically, in the very long run, equity has had the reputation to over-perform bonds, until the global financial crisis has shown that the hierarchy of even 30-year returns was less certain.

Allocating to several asset classes is then a bet on diversification (or is it in fact about trying to avoid bets?); traditionally, this has been modulated by assigning higher or lower weights to one or the other (sub-)asset class, region or the like. Asset allocation traditionally focuses on weights/risks of asset classes and ignores other contributors to risk and return.

In this dashboard, we consider Multi-Asset portfolio construction through the lens of an approach that maximizes, bottom-up, the diversification of the portfolio without relying on forecast of returns and that endogenously balances out exposures to risk drivers that impact returns and risks of a multi-asset portfolio.

## Diversification is the core of asset allocation

In a multi-asset context, allocation is almost everything. In their seminal study Brinson, Singer and Beebower (1991)<sup>1</sup> showed that more than 90% of long-term investment volatility is due to the investors' asset allocation decisions, as to the asset class to include in their portfolios and their long-term weights. Tactical decisions, such as timing the market or playing relative value, are of marginal importance in the long run, even though their use

<sup>1</sup> Brinson, Gary O., Singer, Brian D. and Gilbert L. Beebower (1986), « Determinants of Portfolio performance », Financial Analyst Journal, August, pp- 39-44.

of macro-economic data and signals make them appear prominent. Macro-economic data being essentially public information, the most successful relative bets compensate the lesser ones, and in aggregate their contribution to returns has to remain low when compared to pure exposure<sup>2</sup>.

To allocate weights for the long run requires a different type of approach based on structural assumptions or proven heuristics. In a widely cited article, Pastor and Stambaugh<sup>3</sup> wrote that *even after observing 206 years of data (1802 to 2007), investors do not know the values of the parameters of the return-generating process, especially the parameters related to the conditional expected return [...] and [...] investors recognize that “predictors” used to forecast returns deliver only an imperfect proxy for the conditional expected return.*

This article, among others, casted doubts on the common wisdom that stocks dominated bonds in the long run, and on the life-cycle allocations derived from it. This left room for agnostic, or risk-based approaches, with no views whatsoever but a goal to balance, insofar as possible, the various sources of risk in the allocation. At the extreme, pure risk-based models can be very conservative, as they mimic investor choice under “ambiguity” (i.e. radical uncertainty) and seek to reduce losses without consideration of return.

In what follows, we take a different perspective on asset allocation, one which emphasizes the core of asset allocation and our own investment philosophy, that is the maximization of diversification as a primary investment objective. Our approach to asset allocation, while risk-based, is compatible with the hypothesis that returns are increasing with risk across asset classes, and is in fact fully in-line with modern portfolio theory and its risk-return trade-off.

Not knowing where the best risk-return reward will come from, and recognizing that essentially in an asset class, all relevant information is already public and priced in, investors should apply as much as possible the principle of diversification proposed by Harry Markowitz many years ago.

According to Modern Portfolio Theory, a strategy that has the maximization of portfolio diversification as its very objective, is risk-return efficient whenever single assets are remunerated increasingly with their risk, an assumption that is both reasonable and impactful when putting together heterogeneous assets. The uncertainty associated with time variation in risk rewards over the medium term makes it hard to time them and speaks in favour of an approach that does not engage in tactical allocation trying to predict the time variation in risk rewards<sup>4</sup>. In that context of allocation across asset universes, maximizing diversification from the bottom up to the top makes the most sense<sup>5</sup>.

## Maximum Diversification<sup>®</sup> in a multi-asset context

Acknowledging that it is illusory to own a “crystal bowl”, could lead one to the conclusion that focusing on a systematic approach that relies on applying the concept of diversification may yield superior long-term investment results for rational investors in efficient markets. To this end, we have developed a multi-asset strategy that redefines the way how multi asset investing is done along the lines of Maximum Diversification<sup>®</sup>.

In what follows, we will refer to this strategy as Anti-Benchmark<sup>®</sup> (AB) Multi Asset since it is indeed setting the stage for providing an alternative benchmark to traditional multi-asset benchmarks that are based on cap-weighted indices that are highly concentrated and highly correlated to one another. Moreover, it is also an alternative to making disputable forecasts about asset class returns.

### 1. Diversification as a way to increase allocation to risky assets

<sup>2</sup> As an example, the HFR Macro index delivered 1.5% annually over the last ten years. See also Chan Karceski and Lakonishok (1998), « The Risk and Return from Factors », Journal of Financial and Quantitative Analysis, Vol. 33 (2), pp. 159-188 or Connor, Goldberg and Korajczyk (2010), « Portfolio Risk Analysis », Princeton University Press, on the difficulty of turning forecasts into returns.

<sup>3</sup> Pastor, L. and Stambaugh, R.F., 2012. Are stocks really less volatile in the long run? The Journal of Finance, 67(2), pp.431-478.

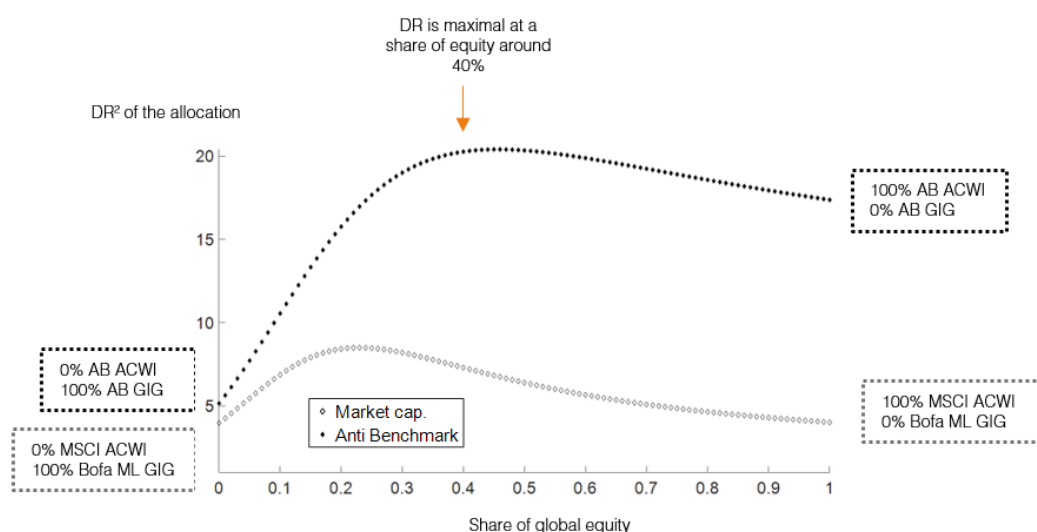
<sup>4</sup> There is a long list of academic and industry papers that has been written on this topic. A very recent piece is for instance Ilmanen, Antti, Israel, Ronen, Moskowitz, Tobias J., Thapar, Ashwin and Franklin Wang (2019), « How Do Factor Premia Vary Over Time? A Century of Evidence », Working Paper.

<sup>5</sup> Interested readers will find additional details in the April 2019 Diversification Dashboard

In order to maximize diversification, we first need to make it measurable. To this end, we make use of the diversification ratio, i.e., the ratio of the weighted sum of portfolio assets' volatilities and the overall portfolio volatility, that we have developed and patented many years ago and that applies not only at the single asset class level but also, when properly defined, for a portfolio of (sub-)asset classes. The higher the ratio, the more diversified is a portfolio.

Figure 1 shows the Diversification Ratio® of a portfolio composed of the equities included in the MSCI ACWI index and bonds included in the BofA ML Global investment Grade index. The two lines represent the Diversification Ratios® of two different types of multi-asset portfolios when increasing the share of equity. The first one is based on the simple market cap indices that were mentioned before and the second line, represents Diversification Ratios® of all combinations of Anti-Benchmark® strategies.

**Figure 1: Ex-ante Diversification Ratio® of a two-asset allocation**



*The figure represents the diversification ratio of a mixed portfolio of global equities and global bonds, using the last three years of returns as inputs, with market cap. and a Maximum Diversification® approach.*

*Sources: TOBAM and Bloomberg.*

We see that the Anti-Benchmark® strategies (share of equity at 0 and 100%) are much more diversified than their market capitalization-based counterparts. The combination is also more diversified, and diversification does not peak so much: The Anti-Benchmark® equity allocation is much more diversified than its market capitalization-based counterpart, which induces the Anti-Benchmark® Multi Asset allocation to be more tilted towards equities than most risk-based allocations.

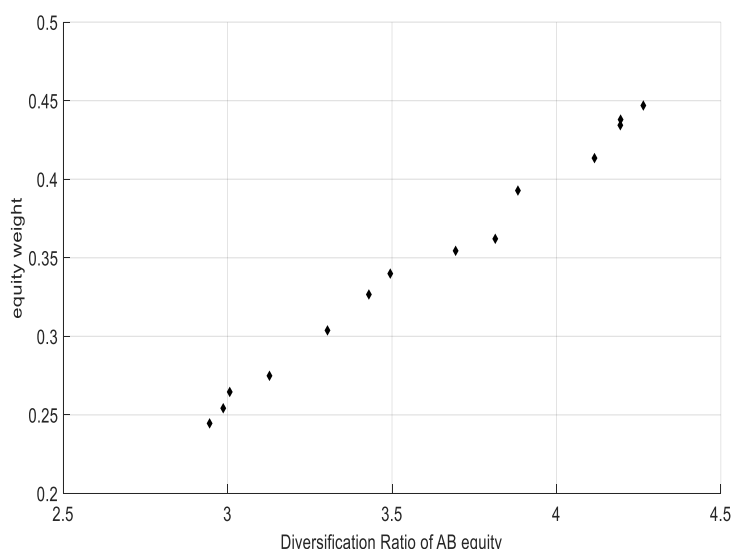
## 2. The share of equity depends on its diversification potential

The following graph explores this question, using again the simplified set-up of a two-asset allocation, i.e., between global equities and global investment grade credit.

Note that the portfolio does not only apply a Maximum Diversification® approach to decide on the weights between two asset classes in a top-down manner (i.e., how much to put into equities and how much into bonds), but also within the asset classes, thus bottom-up.

To facilitate the illustration, we fix the characteristics of the bond strategy (volatility of 3.5% and Diversification Ratio® of 2.5) and vary the Diversification Ratio® of the equity portfolio, using the historical live AB Equity World All Countries portfolio. The results of this exercise are displayed in Figure 2.

**Figure 2: Equity allocation using the Maximum Diversification® approach (based on data from 2013 -2020)**



*This figure uses live data from 2013 to 2019 to explore the weights of a diversified equity Anti-Benchmark in a multi asset allocation based on its Diversification Ratio®. The characteristics of the bond allocation are kept constant.*

*Sources: TOBAM and Bloomberg.*

The diversification of the equity strategy, and in consequence its weight in the portfolio, depends mostly on intra-asset class correlations. Increasing correlations have two effects:

- ✓ first, diversification drops, as we can measure directly using the Diversification Ratio®, and
- ✓ second, volatility rises, thus pushing the equity share down (to a minimum of 20% using recent data)

Such a scenario is likely for instance in times of common market stress that immediately translates into increased equity correlations and hence lower diversification potential coming from equities. This is mainly due to the fact that in such market regimes systematic risk drives even more asset price behavior rather than idiosyncratic risks. Conversely, a more diversified (higher DR) equity portfolio is also less volatile, and its share can get as high as 45%. Thus, the AB Multi Asset allocation, with no market timing or macro views, is still very reactive to market conditions.

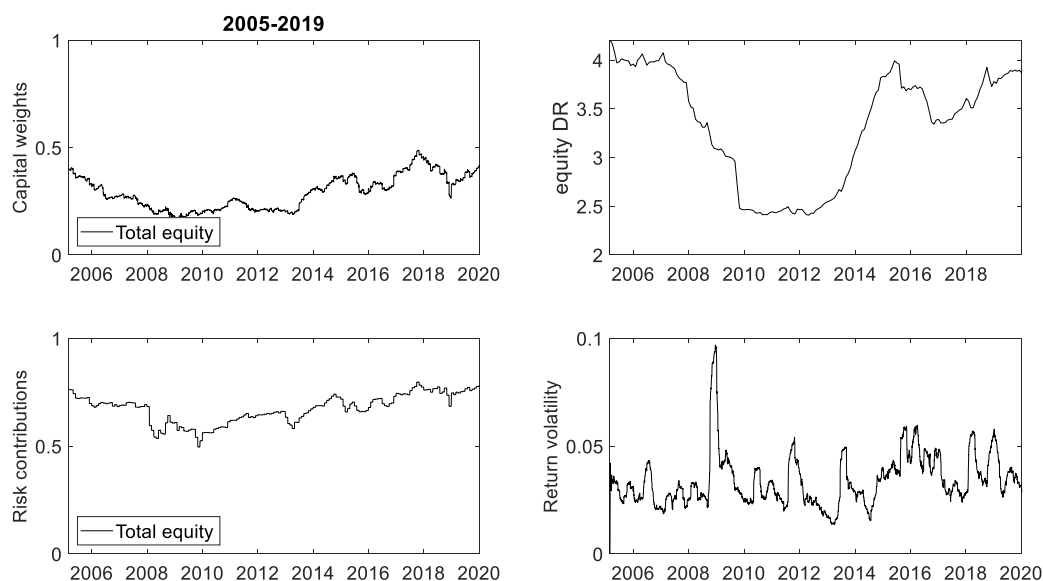
## Historical risk exposures of a maximally diversified multi asset portfolio

### 1. The Anti-Benchmark allocation is balanced on its own

Next, we try to shed more light on the evolution of allocations to risky assets inside an approach that constructs the multi-asset portfolio by bottom-up maximizing its diversification. This approach is used in practice, with three equity strategies and two credit strategies (Investment Grade and High Yield). We show here simulated weights and risk contributions of the equity part of this portfolio, which consists of three maximally diversified sub-portfolios, i.e., a US, World ex-US and an EM one. Figure 3 exhibits the time series of weights, Diversification Ratios® and risk contributions of the equity component in the back-tested AB Multi Asset portfolio.

As a risk-based portfolio, the simulated AB Multi Asset portfolio has had a relatively limited equity share (about 1/3 on average), but compared to other risk-based portfolios that aim to equalize risk contributions as their main investment objective, equity risk accounts for most of the portfolio risk (about 2/3 of the total volatility). Moreover, it is noticeable that in times of market stress, when the correlation inside the equity sub-portfolio drops (systematic risk is much more prevalent in these regimes), the DR ratio of the equity portfolio decreases, its volatility increases due to the market stress and at the same time its weight in the multi-asset portfolio decreases. At the same time, the overall risk contribution remains relatively stable, however, it does show a slight variation along the evolution in the DR.

**Figure 3: Weights, Equity Diversification Ratios®, risk contributions and volatility of a simulated Maximum Diversification® portfolio**



*The figure aggregates capital weights and relative total risk contributions of the three equity strategies, AB US, AB World ex Us and AB EM over the period 2005-2019; the right column shows DR and 60-day volatility.*

*Sources: TOBAM and Bloomberg.*

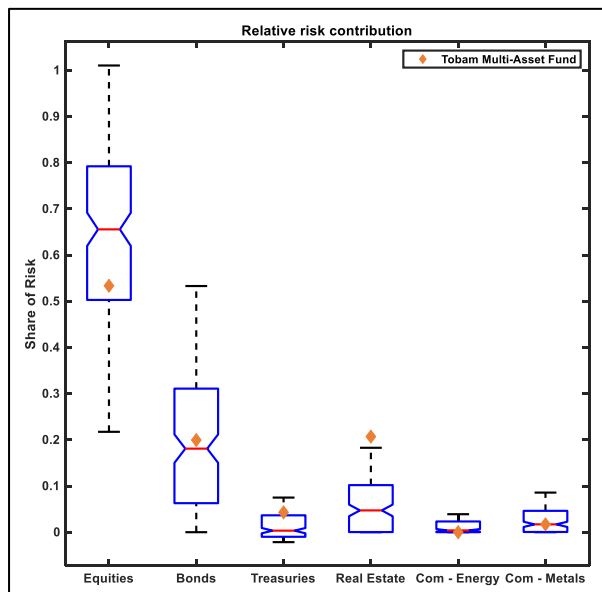
In summary, we can state that using a Maximum Diversification® approach yields a relatively stable risk contribution of risky assets on average over reasonably long investment horizons, while being flexible to accommodate for changes in the risk and correlation structure of the assets.

By its very definition, a multi-asset portfolio draws its returns from the risk rewards accessible in several asset classes.

A traditional 50/50 “balanced” portfolio will be exposed almost exclusively to equity risk that will dominate the rest, given the difference in risk between equities and bonds. The AB Multi Asset allocation will on average be a little lower than 40% invested in equity, however the weights themselves are not fully informative, because our equity strategy is itself maximally diversified and low beta as a consequence. Moreover, the credit component of the portfolio also has a residual equity exposure as the equity portfolio has a certain amount of duration exposure. Hence, as with all multi-asset allocations, risk exposure is a more relevant measure than capital weights. Detailed risk exposures will be presented in the next section, for a variety of assets.

In the previous section, we focused on equity risk contributions of the AB Multi Asset portfolio. In this section we consider other sources of risk. To analyse the various risk exposures of the AB Multi Asset strategy in a realistic set-up, we consider now the live track record of our Multi Asset strategy since 2016. TOBAM's multi-asset fund was launched in December 2016, using existing in-house strategies as underlying, and comprises now five complementary strategies, three for equities (US, World ex-US, Emerging) and two for fixed income (Global IG and Global HY), as described above. In Figure 4 we plot the risk exposure of the AB Multi Asset fund to different major risk factors compared to the distribution of risk exposures of our peer group.

**Figure 4: Relative contributions to total risk**



*This figure represents the contributions of selected factors to the risk of the live AB Multi Asset fund and its peers defined as globally invested balanced funds with volatilities ranging between 4% and 8% from Dec 2016 – Dec 2019. The boxes show the median, first and third quarter of values in the sample of peers, and the extremes are 1% and 99%.*

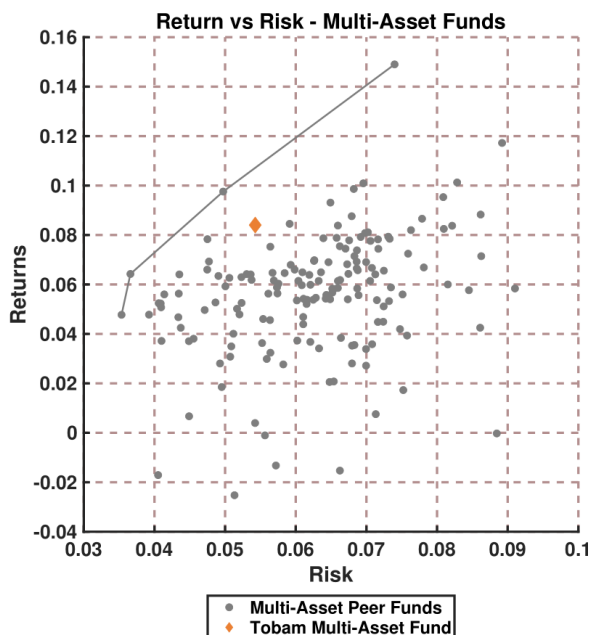
*Sources: TOBAM and Bloomberg.*

We notice a limited tilt towards equity of the AB Multi Asset portfolio, balanced out with sensitivities to other sources of risk. Funds of similar volatility tend to be more dependent on the equity market, and as a consequence more vulnerable during downturns. As a consequence, we are also more exposed to rates (treasuries), via our IG positions.

## Results for Anti-Benchmark Multi-Asset: Diversification performed well over the last years

Comparing the fund with its peers in Figure 5, we see that its volatility is on the low side and its performance has been on the high side, with only a handful of funds doing better. As a consequence, it exhibits one of the best Sharpe ratios of its category.

**Figure 5: Risk-return analysis of live performance**



*This figure represents the risk-return characteristics of the AB Multi Asset fund, together with its peers, defined as globally invested balanced funds with volatilities ranging between 4% and 8% from Dec 2016 – Dec 2019.*

*Sources: TOBAM and Bloomberg.*



The risk/return ratio of the AB Multi Asset strategy is outstanding compared to its peers and also appealing in absolute terms and is higher than what equity could achieve on its own<sup>6</sup> – combining asset classes did deliver a better risk-adjusted return, as expected.

Thanks to its excellent performances, the AB Multi Asset fund has also earned at its 3<sup>rd</sup> anniversary a 5-star rating of Morningstar as its first notation.

## Conclusion

At the heart of any investment in a multi-asset portfolio is the desire to diversify. In this Dashboard, we have shown that it is possible not to make a bet on this objective and rather use the maximization of diversification as the central rule for portfolio allocation.

We propose a multi-asset solution that offers a dynamic allocation between asset classes without relying on market forecasts but purely based on the assessment of diversification opportunities.

Using the already well-diversified Anti-Benchmark<sup>®</sup> equity and fixed income strategies as building blocks and further considering the cross-asset class correlations, the multi-asset solution exploits the diversification opportunities both within and between asset classes in a bottom-up way.

Analysing the sources of the risks, AB Multi Asset turns out to having a more balanced exposure to several asset classes relative to the peers who predominantly have an equity bias.

Given the primary focus is on diversification, by construction, the strategy is well-positioned to achieve good long-term risk-reward ratio and the recent live performance stands testimony to this. During the live period, the strategy is one of the best in terms of Sharpe ratio compared to several of the peer funds in the multi-asset category. It achieves better returns with minimal risks. Even during extreme market downturns such as the Global Financial Crisis in 2008, the strategy in its back-tests had relatively modest drawdowns compared to several of the peer funds.

<sup>6</sup> Over that period, the MSCI ACWI achieved a Sharpe ratio of 1.05, vs 1.2 for the Global Broad Market bond index. AB Multi Asset's Sharpe ratio was 1.5.

## For more information

TOBAM is an asset management company offering innovative investment capabilities designed to increase diversification. Its mission is to provide rational and professional solutions to long term investors in the context of efficient markets.

The Maximum Diversification® approach, TOBAM's flagship investment process founded in 2006, is supported by original, patented research and a mathematical definition of diversification and provides clients with diversified core exposure, in both the equity and fixed income markets.

In line with its mission statement and commitment to diversification, TOBAM also launched a separate activity on cryptocurrencies in 2017.

TOBAM manages US\$8.5 billion (at December 31, 2019). TOBAM's team is composed of 51 professionals.

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