TOBAM
CORE INVESTMENTS

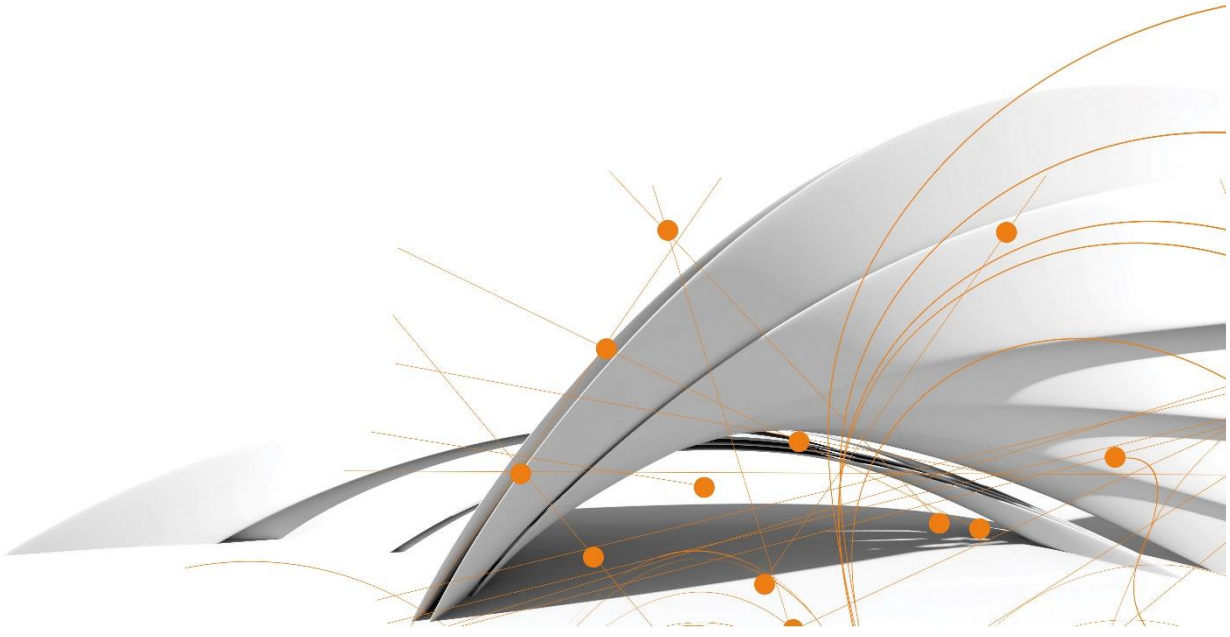
Debunking some of the biggest investment myths

June 2017

The investment management industry relies on foundations and pillars which strongly influence beliefs and decision making. Whilst some are robust and strongly defined, others are either flawed or not well defined, which leads to misunderstandings.

The objective of this note is to discuss some of these myths or misunderstandings and their consequences.

For professional investors only



The Context: deeply rooted myths create confusion

"*Financial markets are inefficient*", "*avoid risky mutual funds with high tracking error*", "*active management is useless, go for passive*", "*look at your holdings to check your risk exposure*" ...

Our industry relies on foundations and pillars which strongly influence beliefs and decision making. Whilst, some are robust and strongly defined, others are either flawed or not well defined, contributing to misunderstandings.

The lack of clear definitions often results in confusion; many statements and their counter-arguments are affirmed and not properly debated.

A possible solution: Nicolas Bourbaki

"*Structures are the weapons of the mathematician*" – Nicolas Bourbaki

In the 1930s a group of mathematicians came together to reformulate modern mathematics from a thoroughly rigorous, self-contained point of view. The group used the pseudonym Nicolas Bourbaki. With the goal of founding all mathematics on a set theory, the group strove for rigour and generality. Their work led to the discovery of several concepts and terminologies still used today.

'The Bourbaki spirit' is incorporated in the work of TOBAM. We share Bourbaki's refusal of concepts that are not precisely defined. We dedicate significant attention to definitions, which we view as a prerequisite to conducting sound and original research work. This means, for example, defying conventional wisdom from the start when facing unclear definitions. While our goal is not to produce an encyclopedic and definitive body of work such as the "Éléments de mathématique[1]" this spirit has a distinctive influence on our approach. Our common research path consists of going from clear definitions to establishing mathematical properties and then – and only then – conducting empirical tests to verify what could be expected from theoretical results.

Undefined concepts have significant consequence, in this note we aim at debunking some of the biggest myths, or misunderstandings our industry is suffering from.

1. Debunking Myth #1: You should not go passive when you can't forecast

Being passive is not equal to being neutral

If the only alternative to forecasting ability is accessing the risk premium in its purest form, some investors in their search for the beta believe that passive management, defined as the investment vehicles tracking market-capitalisation weighted indices, offers access to this beta. There is a myth that "passive = neutral".

Passive investing, which is often described as beta investing, does not provide neutral access to the risk premium. Investing in a capitalisation-weighted benchmark means buying a portfolio that is hugely biased sector wise, style wise, country wise, stock selection wise.

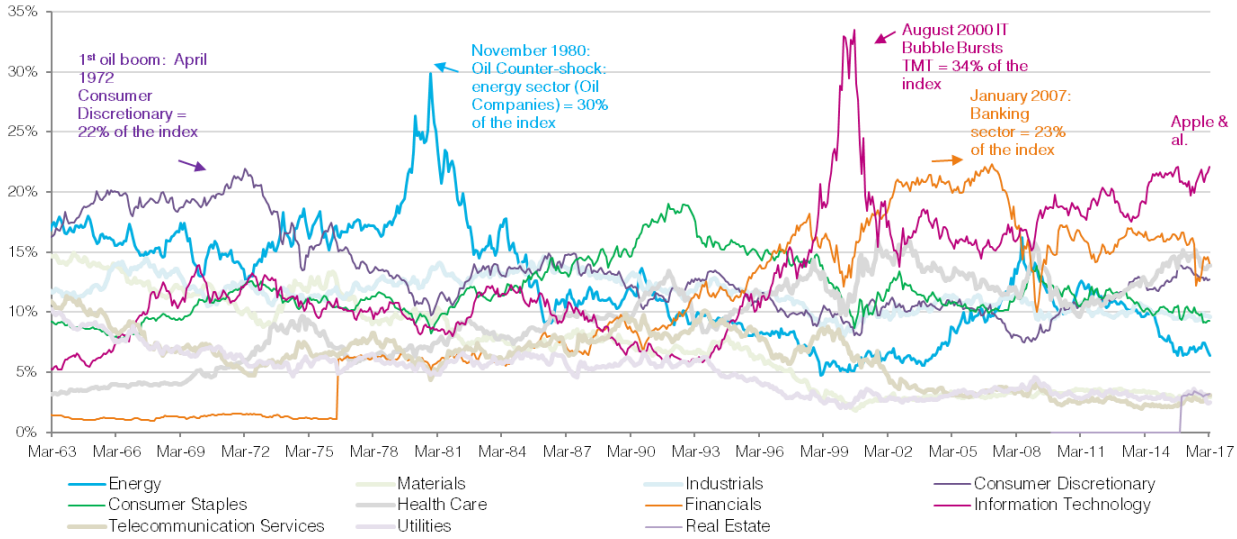
[1] N. Bourbaki, Springer, 2006.

These benchmarks take on heavy structural biases that evolve over time. They are inherently biased as they attribute greater index representation to stocks or factors as they have appreciated and less after they became cheaper. They represent the sum of all speculations of all market participants and these implicit bets change dynamically over time as the benchmark re-weights assets and alters those it tracks. Because they attribute greater representation to stocks whose share prices have risen, market capitalisation-weighted benchmarks reflect past successes.

As a consequence, they do not offer pure beta or immunity from financial speculation.

Furthermore, because an investor tracking these indices would therefore have to allocate more money to the largest risk drivers, these benchmarks inherently forecast that the successes of the past will be successes of the future.

US Equity market – Sector weights



Source: TOBAM calculations. Data from 1962 to March 2017.

The real cost of passive management

These bets are at the end very costly as market cap-weighted benchmarks effectively maximise their allocations to individual stocks on the day of their most expensive price just before they turn down, and minimise allocations on the day they start rising.

Thus, passive investing through market capitalisation-weighted benchmarks ultimately destroys value for investors and emphasises the speculative aspect of market pricing. In doing so, they decrease the stability of markets and the wider global economy by creating significant imbalances. The greater that imbalance becomes, the greater the impact of changes in prices and the more volatility markets will experience. So, while passive investing is often seen as 'cheap' from the point of view of fees, they are somehow a cheap way of investing into quite 'expensive' stocks and risk drivers from a portfolio efficiency perspective and they often fail to be close to the efficient frontier ex-post.

2. Debunking Myth #2: Tracking Error does not measure risk

Too often market participants talk about portfolios that exhibit 'high' or 'low' tracking error and then make inferences from this information on the 'riskiness' of their investments.

A tracking error measures the distance between two portfolios.

$$TE = \sqrt{^{t}(P-B)V(P-B)}$$

Where:

TE = Tracking Error
P: Portfolio – vector of asset weights
B: Benchmark – vector of assets weights
V: Covariance matrix

A tracking error does not measure anything in absolute terms; It is exclusively a relative measure. It is by definition a two-argument reference. Its interpretation depends necessarily on the basis of comparison. A tracking error cannot be interpreted as a proxy measure of risk, it does not even provide a correlation with an absolute risk measure.

In the context of TOBAM's Maximum Diversification® approach, the tracking error between our portfolios and the reference market-cap weighted index indicates how far the benchmark is from being diversified. It measures in fact the size of the benchmark bets.

The examples below illustrate this notion, with two different universes.

Case 1 shows the Korean equities market, which is a very concentrated market with Samsung accounting for approximately 27% of the index.

Case 1: South Korean Equities Market (Kospi 200 Index)

Chart 1: Volatility
Anti-Benchmark Korea versus Kospi 200

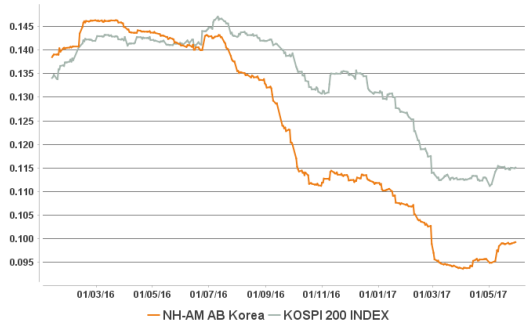


Chart 2: Tracking Error
Anti-Benchmark Korea versus Kospi 200

Source: TOBAM & Kospi. Data as of May 2017.

The volatility of the Anti-Benchmark® Korea Equity strategy (Chart 1) is much lower than that of the Kospi 200 (its reference index). While looking at the tracking error of the Anti-Benchmark versus its reference index, a very high level of tracking error is observed - around 18% on average over the past two years (Chart 2).

Chart 3: Sources of Volatility (ex-ante)
Anti-Benchmark Korea versus Kospi 200

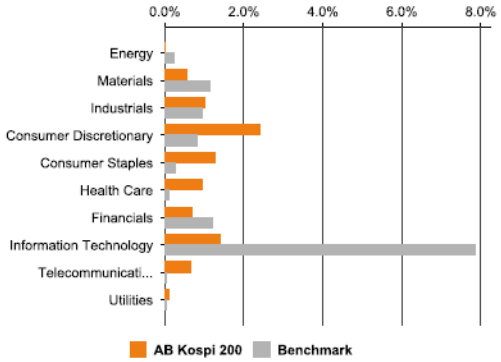
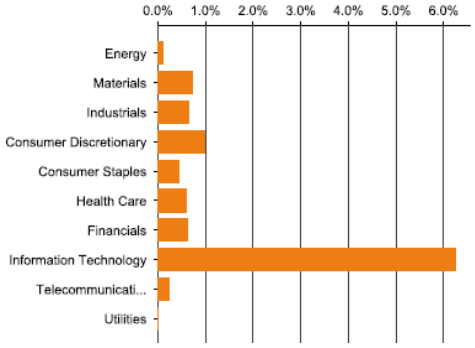


Chart 4: Sources of Tracking Error
Anti-Benchmark Korea (versus Kospi 200)



Source: TOBAM & Kospi AB Korea Factsheets as of March 2017.

Chart 3 and 4 provide a deeper insight into Case 1 and show that by far the main source of volatility in the Kospi Index comes from the Information Technology sector, and more specifically, Samsung.

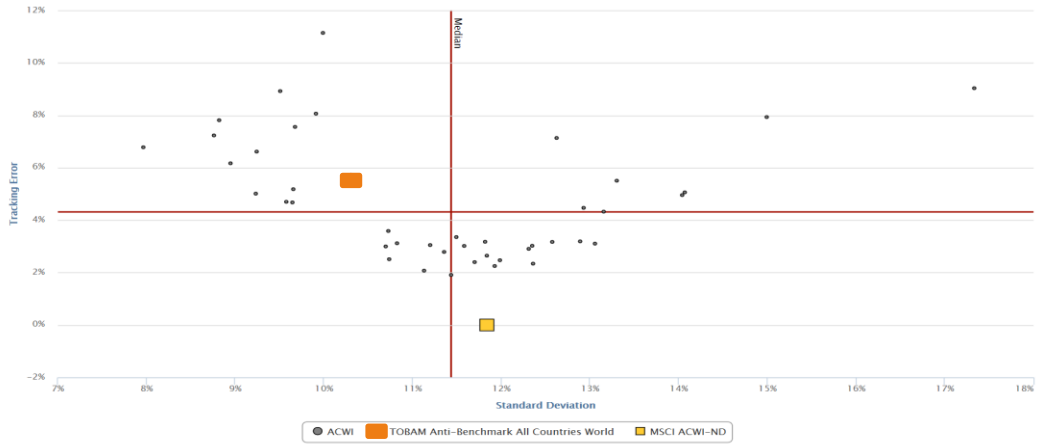
The Anti-Benchmark® approach, by delivering a diversified portfolio avoids such concentrations of risks and hence its main sources of tracking error come from the Information Technology sector, notably the fact that the Anti-Benchmark® has no bias towards IT nor Samsung like the benchmark has. In simpler terms, the distance between the Anti-Benchmark® and the Kospi 200 is significant because the very concentrated benchmark is very far away from the well diversified Anti-Benchmark®. Again, this does not give an indication to the level of risk of the portfolios.

Case 2: All Countries World Investment Universe

Case 2 analyses the All Countries World Funds (ACWI) Universe, comprised of the MSCI ACWI, TOBAM's Anti-Benchmark® ACWI Equity strategy and the funds invested in the same universe as presented by Evestment. Chart 5 plots the tracking error compared to the reference index, and the risk of the funds (measured by the standard deviation). The chart shows that there is no correlation between the two measures.

Following the example with the strongly biased Kospi 200 universe, ACWI is an interesting universe to illustrate our point, because it is a large universe, and it also incorporates a wide range of mutual funds.

Chart 5: ACWI Investment Universe
Standard Deviation & Tracking Error



Source: TOBAM, Evestment. ACWI universe long only equity funds (Evestment universe) as of April 2017 (2-year monthly data).

- A tracking error does not measure anything in absolute terms. It is by definition a two-argument reference.

- A tracking error is not a proxy of a risk measure, it does not even provide a correlation with a risk measure

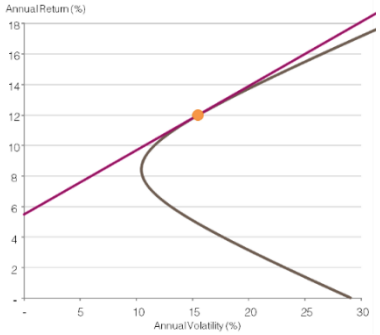
- It does not measure:
  - Economic capital risk
  - Drawdown risk
  - Specific risks (concentrations)…

⇨ It does not even give an indication of risk

3. Debunking Myth #3: The ambiguity around the term "Efficiency"

There is an ambiguity around the term "efficient". In the investment industry, it can be used in two different contexts, with, hence, two different meanings: An efficient *portfolio* and an efficient *market*.

- An efficient portfolio is a portfolio that sits on the efficient frontier, meaning a portfolio, delivering a consistent level of returns given the level of risk.



- An "efficient market" is a market in which all (current and historic) information, is taken into account in asset prices. In efficient markets, it is quite difficult to forecast the direction of securities' prices in the future. Looking at the financial markets, if an investor believes that forecasting risk rewards is difficult, then the most efficient portfolio for an investor to own is the non-diversifiable portfolio.

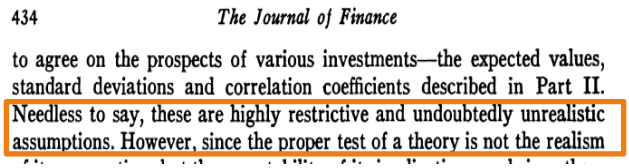
  The issue with market cap-weighted benchmarks is not that markets are inefficient. We should consider the issue the other way around:
  - Markets are difficult to forecast => they are quite efficient
  - The real problem of market cap-weighted benchmarks is their own lack of diversification

4. Debunking Myth #4: CAPM does not demonstrate that benchmarks are efficient

The Capital Asset Pricing Model (CAPM), developed by William Sharpe in the 1960's, provided a coherent framework for the fundamental question in finance on how the risk of an asset should affect its expected return.

The 1964 paper published by William Sharpe in the Journal of Finance "*Capital asset prices: a theory of market equilibrium under conditions of risk*" has been interpreted by some industry participants as a demonstration of the efficiency of market cap-weighted benchmarks.

TOBAM considers this to be the foundation of one of the largest misunderstandings in our industry.


434 *The Journal of Finance*

to agree on the prospects of various investments—the expected values, standard deviations and correlation coefficients described in Part II. Needless to say, these are highly restrictive and undoubtedly unrealistic assumptions. However, since the proper test of a theory is not the realism

In his paper, William Sharpe actually demonstrates: That under a set of assumptions that is "*highly restrictive and undoubtedly unrealistic*", the market cap-weighted portfolio is efficient.

In a nutshell, the CAPM could be seen as an elegant way of proving that it is "*undoubtedly unrealistic*" that the market cap-weighted benchmark could ever be an efficient investment.

5. Debunking Myth #5: Do not look at your holdings, wear correlation glasses!

How should one define exposure to a risk driver? Just looking at a portfolio's weights allocation in a stock or a sector does not give an accurate picture of its exposures. "Looking at your holdings" is not the solution.

To mitigate stock-specific risk, many investors choose to allocate portfolio holdings over as broad a selection of stocks as possible and/or simply keep portfolio allocations close to those of the market capitalisation benchmark. However, both practices may lead to overexposure to stock-specific risk factors.

Let us consider a Japanese stock portfolio and try to answer two simple questions about this portfolio:

Question 1: *How much is the portfolio exposed to oil price variations?*

In order to answer this question, an investor should not run to his/her desk and count the barrels of oil in the portfolio, the scientific answer to this question consists into computing the portfolio's correlation to the variations of the price of oil.

Question 2: *How much is the portfolio exposed to the variations in Toyota's stock price?*

The answer to this question is not that an investor's portfolio holds 2.5% of its market value in Toyota shares. Combining these 2.5% with the remaining 97.5% stocks – that are not correlated to Toyota – your portfolio's exposure to Toyota is actually lower than if you held only 1% in Toyota but the remaining 99% were highly correlated to Toyota.

The scientific answer to this question is thus to calculate the correlation between the portfolio and Toyota.

A portfolio's true exposure to any given phenomena (or source of risk) is measured by the portfolio's correlation to this source of risk, whether this source of risk is the price of oil, inflation… or the price of Toyota.

As such, what matters is not the weight of a stock or a sector in the portfolio, but rather the portfolio's correlation to the risk factor it represents.

Table 6: World Universe: Anti-Benchmark Portfolio Correlation to sector and sector weights
Example as of 31/12/2011

Sector Correlation with World Portfolio		
Sectors	*Correlation to Sector**	*Weights***
Energy	83.5%	0.00%
Materials	85.7%	9.36%
Industrials	88.5%	5.63%
Consumer Discretionary	89.3%	14.78%
Consumer Staples	85.8%	27.88%
Health Care	87.6%	8.76%
Financials	83.0%	7.55%
Information Technology	85.0%	5.17%
Telecommunication Services	82.8%	5.78%
Utilities	82.1%	14.07%

**Average correlation over 2011 (daily data)*
*** Portfolio weights as of 31/12/2011*

Table 6 shows the sector weights in the Anti-Benchmark World strategy as well as the correlations of the portfolio to the sector.

It illustrates how, despite having 0% of energy stocks in the portfolio, the correlation of the portfolio to the energy sector is as high as 83.5%. To the contrary, Utilities is represented at 14.07% in the portfolio (the third largest sector in the portfolio by weight) but, this sector is even less correlated to the portfolio than the energy sector.

All the risk drivers present in the market are represented in the portfolio, even if the portfolio has no position in a given stock or sector.

TOBAM's approach considers diversification in terms of the portfolio's exposure to the idiosyncratic risks of its constituents.

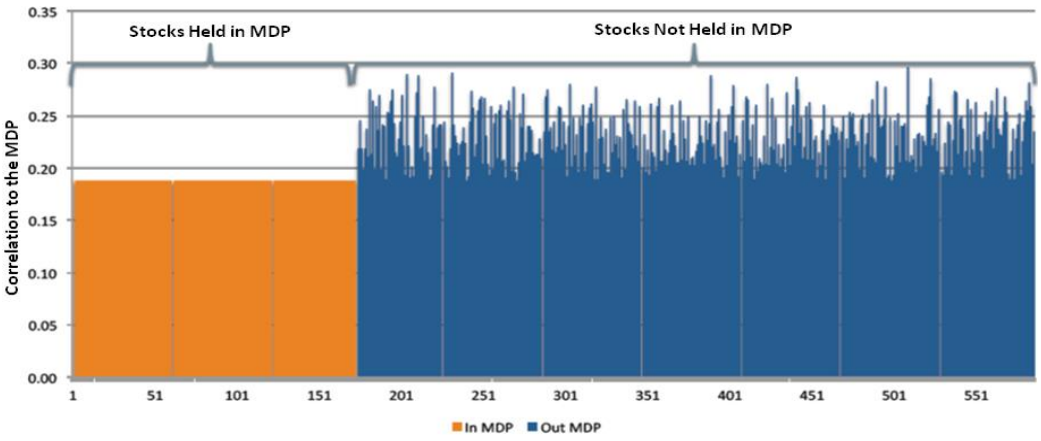
i. The "minimum idiosyncratic risk" portfolio is the portfolio that is the least exposed to any individual stock in the universe. As a reminder, exposure means correlation.

ii. TOBAM's research has demonstrated that the Most Diversified Portfolio is the only portfolio that is less correlated to any of its holdings than to any stock it is not holding. The higher correlation of the stocks not held in the portfolio is the reason it does not hold these other stocks.

"Any stock not held by the MDP is more correlated to the MDP than any of the stocks that belong to it. Moreover, all stocks belonging to the MDP have the same correlation to it." [2]

The graph 7 below illustrates the correlation of stocks, both within and outside of the portfolio, to the Most Diversified Portfolio:

Chart 7: Correlation of stocks to the Most Diversified Portfolio



[2] *Choueifaty, Yves; Froidure, Tristan; Reynier, Julien; « Properties of the Most Diversified Portfolio », Journal of Investment Strategies, Vol. 2 No. 2, Spring 2013, pages 5-6.*

The Anti-Benchmark® portfolio is less correlated to the stocks it holds than to the stocks it does not hold. Not a bad candidate to be the minimum idiosyncratic risk portfolio.

6. Debunking Myth #6: Risk factor investing does not belong to Smart beta

In 2005 and 2006, a handful of pioneers in the asset management industry started a new initiative, later defined as the smart beta initiative.

However, over time, an increasing number of strategies have been launched under the "smart beta" banner that vary in their ability to deliver pure beta. One of the most notable changes has been the proliferation of 'factor-based' investment strategies in the space.

The origins of risk factors investing date back to the 1970's, when Stephen A. Ross in 1976 contributed to popularise the original terms "factors", and, in the same year, Rosenberg & Marathe wrote "*Common factors in security returns*".

The financial industry, in our opinion is lacking a Nicolas Bourbaki to clarify the terminology and definitions used and this is leading to confusions and even contradiction.

There is a fundamental contradiction in the sentence:

"*Risk factor investing belongs to Smart Beta*"

What are the conditions that should be met in order for an approach to be qualified as "Smart Beta"?

Why smart first? Let's be intuitive.

There is "Smart Beta" probably because there is a "dumb beta", and this must be the market cap weighted index. As a matter of fact, buying an approach that systematically consists into increasing one's exposure to a typical risk driver - the more expensive this risk driver gets everything else being equal - is "smart" in only one case: if the investor believes for example in the case of the S&P 500 that the S&P 500 index will disappear and become the S&P1, meaning if at the end of the day concentration shall win.

Why beta? Let's be intuitive.

What is Alpha? Alpha is the result of insights. If a portfolio manager is rightfully insightful, his alpha will be positive. If he is wrong in his views his alpha will be negative. A portfolio manager that has the conviction that a specific risk driver will reward the risk better than another risk driver will build a portfolio risk-biased towards the first one in order to take advantage of this insight.

A beta portfolio is not about being insightful. The good news that Smart Beta brings it is that even when you cannot forecast, even if you're not insightful, you still can build a portfolio that makes plenty of sense, more sense than the market cap weighted beta. You can build a Smart Beta portfolio. From that point of view a **beta portfolio needs to be un-insightful, as agnostic as possible.**

Factor investing involves targeting a particular factor tilt or set of so (such as value, low volatility, or growth stocks for example). It is about taking advantage of risk reward heterogeneity. It is about being insightful.

Risk factor investing relies on an ability to determine mispricing which would represent a capability to assess what is cheap and will become expensive. Hence why we question its belonging to the 'Smart Beta' movement. In fact, it is not about beta at all. **It is alpha.**

7. Debunking Myth #7: The role of active management does not consist into beating the benchmark

There is a commonly held, but deeply misguided perception that the average active manager does not represent value for money because they cannot beat a market cap-weighted benchmark.
One aspect of this perception is true – the average active manager cannot beat the market cap-weighted benchmark. But that's where the truth ends.

The reason for that lack of outperformance does not stem from lack of skill, as is widely believed. This perception problem haunting active managers is rooted in a very simple, yet profound, misunderstanding both of market benchmarks and how the market work.

By definition the average active manager cannot outperform the benchmark because the benchmark is determined by the sum of activity carried out by both active and passive managers. And because passive managers have no impact on the benchmark – they merely follow it - it is, in fact, the sum of all the bets taken by active managers that determines the benchmark.

Market = μ x Passive + (1- μ) x Active

Market performance ~ Benchmark performance
Passive performance ~ Benchmark performance

Hence => Active ~ Benchmark

It is obvious that it is impossible for the average active manager to outperform (or underperform) the average active manager. The benchmark is, after all, the output of all the activities carried out by active managers.

The role of active managers

It is vitally important that investors understand benchmarks are an output of the investment management industry, and should never be used as an input. As we have seen, confusing this point is dangerous for both their own investment performance and for the economy as a whole. Yes, the average active manager cannot beat a market cap-weighted benchmark, but that does not mean they are useless as a group. Far from it.

The role of active managers as a group is not to outperform the index, but to drive that index **up** and, therefore, the economy. They play a vitally important role in creating wealth and prosperity for savers and should very much sit at the heart of portfolio management strategies.

In turn, and in our opinion, long term active managers should recognise their role is not to beat a benchmark – they are the benchmark. They play a much more fundamental role, they run the economy and should focus on doing the best possible job in that role.

Conclusion

A growing body of empirical evidence sheds light on some of the largest misunderstandings in the asset management industry and the confusions which prevail. The benefits of realising that some long-standing beliefs are false can be very significant: numerous sophisticated institutional investors have already come to realise the inadequacies of passive management and hence the lack of relevance of the tracking error as a risk measure and are using correlations, rather than weights, to measure exposures to various types of risks. More education needs to be made to help investors understand the real meaning of various investment terms that continue to confuse and potentially lead to unintended negative consequences for their investments.

TOBAM*
CORE INVESTMENTS

For more information

TOBAM is an asset management company offering innovative investment capabilities whose aim is to maximise diversification. TOBAM's Maximum Diversification® approach, supported by original, patented research and a mathematical definition of diversification, provides clients with diversified core exposure, in both the equity and fixed income markets. The company manages $8.8 billion (September 2017).
Its team includes 49 investment professionals.

Contacts

Paris
49-53, Avenue des Champs-Elysées
75008 Paris
France

New York
Dublin
Hong Kong

Client Service
clientservice@tobam.fr

Disclaimer

This material is solely for the attention of institutional, professional, qualified or sophisticated investors and distributors. It is not to be distributed to the general public, private customers or retail investors in any jurisdiction whatsoever. This document is intended only for the person to whom it has been delivered.

Funds and/or SICAV specific information may have been provided for information solely to illustrate TOBAM's expertise in the strategy. Funds or the SICAV that might be mentioned in this document may not be eligible for sale in some states or countries and they may not be suitable for all types of investors. In particular, TOBAM funds are not registered for sale in the US, and this document is not an offer for sale of funds to US persons (as such term is used in Regulation S promulgated under the 1933 Act). This material is provided for information purposes only and does not constitute a recommendation, solicitation, offer, advice or invitation to purchase or sell any fund, SICAV or sub-fund or to enter in any transaction and should in no case be interpreted as such, nor shall it or the fact of its distribution form the basis of, or be relied on in connection with, any contract for the same.

The information provided in this presentation relates to strategies managed by TOBAM, a French investment adviser registered with the U.S. Securities and Exchange Commission (SEC) under the U.S. Investment Advisers Act of 1940 and the Autorité des Marchés Financiers (AMF) and having its head office located at 49-53 avenue des Champs Elysées, 75008 Paris, France. TOBAM's Form ADV is available free of charge upon request. In Canada, TOBAM is acting under the assumed name "Tobam SAS Inc." in Alberta and "TOBAM Société par Actions Simplifiée" in Québec.
Investment involves risk. All investors should seek the advice of their legal and/or tax counsel or their financial advisor prior to any investment decision in order to determine its suitability. The value and income produced by a strategy may be adversely affected by exchange rates, interest rates, or other factors so that an investor may get back less than he or she invested.

Past performance and simulations based on thereon are not indicative of future results nor are they reliable indicators of future performance. Any performance objective is solely intended to express an objective or target for a return on your investment and represents a forward-looking statement. It does not represent and should not be construed as a guarantee, promise or assurance of a specific return on your investment. Actual returns may differ materially from the performance objective, and there are no guarantees that you will achieve such returns. Back tests do not represent the results of an actual portfolio, and TOBAM does not guarantee the accuracy of supporting data. The constraints and fees applicable to an actual portfolio would affect results achieved.

This material, including back tests, is based on sources that TOBAM considers to be reliable as of the date shown, but TOBAM does not warrant the completeness or accuracy of any data, information, opinions or results. TOBAM has continued and will continue its research efforts amending the investment process from time to time accordingly. TOBAM reserves the right of revision or change without notice, of the universe, data, models, strategy and opinions. TOBAM accepts no liability whatsoever, whether direct or indirect, that may arise from the use of information contained in this material. TOBAM can in no way be held responsible for any decision or investment made on the basis of information contained in this material. The allocations and weightings, as well as the views, strategies, universes, data, models and opinions of the investment team, are as of the date shown and are subject to change.

This document and the information herein is disclosed to you on a confidential basis and shall not be reproduced, modified, translated or distributed without the express written permission of TOBAM or TOBAM NORTH AMERICA and to the extent that it is passed on, care must be taken to ensure that any reproduction is in a form which accurately reflects the information presented here. This information could be presented by TOBAM NORTH AMERICA, a wholly-owned subsidiary of the TOBAM group of companies that is authorized to present the investment strategies of TOBAM, subject to TOBAM's supervision, but is not authorized to provide investment advice.