Mass Customisation versus Mass Production in Investment Management

How An Industrial Revolution is about to Take Place in Investment Management and Why it Involves a Shift from Investment Products to Investment Solutions

January 2016

An EDHEC-Risk Institute Publication
I would like to thank Sanjiv Das for very useful comments.

A version of this paper is forthcoming in The Journal of Investment Management.
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About EDHEC-Risk Institute

About the Author

Lionel Martellini is Professor of Finance at EDHEC Business School and Director of EDHEC-Risk Institute. He has graduate degrees in economics, statistics, and mathematics, as well as a PhD in finance from the University of California at Berkeley. Lionel is a member of the editorial board of the Journal of Portfolio Management and the Journal of Alternative Investments. An expert in quantitative asset management and derivatives valuation, his work has been widely published in academic and practitioner journals and he has co-authored textbooks on alternative investment strategies and fixed-income securities.
Introduction: New Challenges in Institutional and Individual Money Management
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Over the last 15 years or so, the investment industry has experienced a series of profound structural changes, and an increasing number of serious new challenges are being faced by both institutional and individual investors as a result of these changes.

On the institutional side, pension funds have been particularly impacted by the shift in most accounting standards towards the valuation of pension liabilities at market rates, instead of fixed discount rates, which has resulted in increased volatility for pension liability portfolios (see Fabozzi et al., 2014, for a discussion on pension liability discounting rules). This new constraint has been reinforced in parallel by stricter solvency requirements that followed the 2000-2003 pension fund crisis, while ever stricter solvency requirements are also increasingly being imposed on insurance companies in the US, Europe and Asia.

These evolutions in accounting and prudential regulations have subsequently led a large number of corporations to close their defined-benefit pension schemes so as to reduce the impact of pension liability risk on their balance sheet and income statement. Overall, a massive shift from defined-benefit to defined-contribution pension schemes is taking place across the world. Consequently, individuals are becoming increasingly responsible for making investment decisions related to their retirement financing needs, investment decisions that they are not equipped to deal with given the low levels of financial literacy within the general population and the reported inability of financial education to significantly improve upon the current situation (Fernandes et al., 2014).

In such a fast-changing environment and an increasingly challenging context, the need for the investment industry to evolve beyond standard product-based market-centred approaches and to start providing both institutions and individuals with meaningful investor-centric investment solutions has become more obvious than ever.

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To get a better sense for how the investment process critically needs to evolve, I will first discuss the standard long-term investment approach widely adopted in institutional money management practice. In this traditional approach, asset allocation practices are firmly grounded around one overarching foundational concept, the policy portfolio – a theoretical reference portfolio allocated among asset classes according to a mix deemed to be most appropriate for the investor.

The first step of the investment process therefore consists in grouping individual securities into somewhat arbitrary asset classes or sub-classes according to several dimensions such as equity or debt, and then country, sector and/or style within the equity universe, or country, maturity and credit rating within the bond universe. Once a centralised decision maker (e.g. a pension fund chief investment officer) has decided how much capital should be allocated to the different asset classes and sub-classes, one or more internal or external asset managers are then expected, in a second step, to decide how to allocate the funds made available to the individual securities within the corresponding asset class (see van Binsbergen et al., 2008, for a recent analysis of the efficiency loss involved in this two-step process).

In a nutshell, the key sources of added value in this investment process according to the old paradigm are (1) the ability to design a meaningful policy portfolio, and (2) the ability to select the right managers, who themselves are expected to demonstrate an ability to select the right securities (the case of active managers) or accurately replicate an arbitrary index chosen as a benchmark (the case of passive managers). In the face of the aforementioned profound structural changes, this old paradigm has progressively been recognised as a purely functional and obsolete method for organising the investment process, which is somewhat orthogonal to the needs of investors. Due to its sole focus on market risks (risks embedded within asset class benchmarks and associated investment managers), the traditional approach fails to account for what is the only relevant risk for institutional and individual investors, namely the risk of not achieving their meaningful goals.

The need to move away from the old paradigm is progressively surfacing on many apparently distinct dimensions, which I argue start to form a whole new coherent investment framework when carefully examined.

The first driving force behind the paradigm change that has taken place in institutional money management over the last 15 years has been the progressive recognition that pension fund investments should not be framed in terms of one all-encompassing reference policy portfolio, but instead in terms of two distinct reference portfolios (Martellini, 2006). These two portfolios are, respectively, a liability-hedging portfolio (LHP), the sole purpose of which is to hedge away as effectively as possible the impact of unexpected changes in risk factors affecting liability values (most notably interest rate and inflation risks), and a performance-seeking portfolio (PSP), the focus of which is to provide investors with an efficient harvesting of risk premia, without any constraints related to a possible liability mismatch.

This dual portfolio approach is consistent with the “fund separation theorems”, which lie at the core of asset pricing theory since Tobin (1958) and which advocate...
a separate management of performance and risk control objectives, extended to an asset-liability management context. More generally, and regardless of the exact form of implementation of what is now known as liability-driven investing (also known as liability-directed investing or LDI), this change has led to an increased focus on liability risk management, which is precisely a first step towards properly accounting for an institutional investor’s meaningful objective, and the risk factors that impact the probability of said objective being achieved.

The death of the policy portfolio, the first pillar of the old investment paradigm, had actually been announced, or rather predicted, by Peter Bernstein as early as 2003 in his "Economics and Portfolio Strategy" newsletter, independently of the emergence of an increased focus on liability risk management. This early announcement resulted from the recognition that there is no such thing as a meaningful policy portfolio; one should instead think in terms of a meaningful dynamic policy portfolio strategy. The claim here is that the need to react to changes in market conditions as well as changes in margin for error with respect to investors most important goals invalidates the relevance of any optimal portfolio that would be held constant for a sustained period of time (Merton, 1971). When transported to an asset-liability context, this recognition leads to the emergence of dynamic, as opposed to static, liability-driven investing (see Badaoui et al., 2014, for more details on the benefits of such strategies and its adoption by sophisticated institutional investors).

In parallel to the emergence of dynamic liability-driven investing, the second driving force behind the paradigm change is the progressive adoption of a new approach known as factor investing, which has recently emerged in investment practice and which recommends that allocation decisions be expressed in terms of risk factors, as opposed to standard asset class decompositions. Once again, the focus is to move away from a market-centric perspective towards an investor-centric perspective, which should start with a thorough analysis and proper understanding of the risk factors that have a meaningful influence on the probability of asset owners achieving their goals.

This evolution has delivered a fatal blow to the second pillar of the old investment paradigm, namely the focus on manager selection. Indeed, while risk factors have long been used for risk and performance evaluation of actively managed portfolios, the growing interest among sophisticated institutional investors in risk allocation and factor investing (Ang, 2014; Martellini and Milhau, 2015) leads to a disciplined approach to portfolio management that is meant to allow investors to harvest risk premia across and within asset classes through liquid and cost-efficient systematic strategies, without having to invest with active managers (see in particular the analysis of the Norwegian Government Pension Fund Global by Ang, Goetzmann and Schaefer, 2009).

In this context, the emergence of smart beta investment solutions is blurring the traditional clear-cut split between active and passive equity portfolio management (Amenc et al., 2012), while smart factor indices, formally defined as efficient and well-diversified replicating portfolios for rewarded risk factors, now form a basis of cost-efficient investment vehicles that can be used by institutional investors to...
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harvest traditional and alternative risk premia (Amenc et al., 2014).13

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The Evolution from Mass Customisation to Mass Production and the Emergence of Goal-Based Investing in Individual Money Management

While developments have started in institutional money management, I view as a critically important challenge the need to transport them to individual money management, where the massive shift of retirement risks onto individuals is laying a great responsibility at the feet of the investment management industry in terms of how to provide households with suitable retirement solutions.

Investment management is actually justified as an industry only to the extent that it can demonstrate a capacity of adding value through the design of meaningful investment solutions that allow investors to meet their meaningful goals.

Unfortunately, currently available investment options hardly provide a satisfying answer to the retirement investment challenge, and most individuals are left with an unsatisfying choice between, on the one hand, safe strategies with very limited upside potential, which will not allow them to generate the kind of target replacement income they need in retirement and, on the other hand, risky strategies offering no security with respect to minimum levels of replacement income – see Bodie et al. (2010) for an analysis of the risks involved in the use of target date fund investments in a retirement context.14

This stands in contrast with a well-designed retirement solution that would allow individual investors to secure the kind of replacement income in retirement needed to meet their essential consumption goals, while generating a relatively high probability of them achieving their aspirational consumption goals, with possible additional goals including healthcare, old age care and/or bequest goals.

I argue that some dramatic changes with respect to existing investment practices are needed to facilitate the development of such meaningful retirement solutions. Just as in institutional money management, the need to design an asset allocation solution that is a function of the kinds of particular risks to which the investor is exposed, or to which the investor needs to be exposed, to meet liabilities or to fulfil goals, as opposed to purely focusing on the risks impacting the market as a whole, makes standard approaches (which are based on balanced portfolios invested in a mixture of asset class portfolios actively and passively managed against market benchmarks) mostly inadequate.

This recognition is leading to a new investment paradigm, which has been labelled goal-based investing (GBI) in individual money management (Chhabra, 2005).15 where investors’ problems can be fully characterised in terms of their lifetime meaningful goals (see Lopes, 1987, for an analysis of investors’ aspirational goals throughout their life cycle), just as LDI has become the relevant paradigm in institutional money management, where investors’ problems are broadly summarised in terms of their liabilities.

In a nutshell, GBI includes two distinct elements (see Deguest et al., 2015, for a detailed analysis).17 On the one hand, it involves disaggregating investor preferences into a hierarchical list of goals, with a key distinction between essential and aspirational goals, and the mapping of these groups according to hedging

portfolios that possess corresponding risk characteristics. On the other hand, it involves an efficient dynamic allocation to these dedicated hedging portfolios and a common PSP. In this sense, the GBI approach is formally consistent with the fund separation theorems that serve as founding pillars for dynamic asset pricing theory, as was the case for the LDI approach (see Shefrin and Statman, 2000, and Das et al., 2010, for an analysis of the relationship between Modern Portfolio Theory portfolio optimisation with mental accounts in a static setting).18,19
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The Relationship between Dynamic Asset Pricing Theory and Goal-Based Investing
The Relationship between Dynamic Asset Pricing Theory and Goal-Based Investing

When observed more precisely, the first output of the new investment framework consists in designing a goal-hedging portfolio (GHP) for each essential goal. The general objective assigned to this portfolio is to secure the goal with certainty and to do so at the cheapest cost. Its exact nature depends on the type of goal under consideration.

For a retirement goal, the GHP is typically a deferred inflation-linked annuity (or a suitably-defined dynamic replicating portfolio for a deferred inflation-linked annuity) that will pay the inflation-protected required level of replacement income in retirement. In addition to financing hedging portfolios associated with all essential goals, the investor also needs to generate performance so as to reach aspirational goals with a non-zero probability. In this context, investors should allocate some fraction of their assets to a well-diversified PSP in an attempt to harvest risk premia on risky assets across financial markets, as was also advocated within institutional money management under the LDI paradigm.

One natural benchmark strategy consists in securing all essential goals, and investing the available liquid wealth in a performance portfolio allowing for the most efficient harvesting of market risk premia. This strategy, which is appealing since it secures essential goals with probability 1 and generates some upside potential required for the achievement of important and aspirational goals, is in fact a specific case of a wider class of (in general) dynamic goals-based investing strategies.

These strategies advocate that the allocation to the safe (with respect to investors' goals) rather than the risky portfolio should be taken as some function of the current wealth level and the present value of the fraction of essential goals that is not financed by future cash inflows, with the key property that this function (the parameters of which generally depend on market conditions) should converge to zero when wealth converges to levels required for securing essential goals.20

From a formal standpoint, the problem can be handled via the so-called convex duality or martingale approach to dynamic asset allocation problems (Karatzas, Lehoczky and Shreve, 1987; Cox and Huang, 1989),21,22 where one first defines an optimal state-contingent wealth for investors given their long-term goals and constraints, and then obtains the optimal dynamic asset allocation strategy as the dynamic replicating portfolio strategy for the non-linear contingent pay-off.

I emphasise that the framework should not only be thought of as a financial engineering device for generating meaningful investment solutions with respect to investors' needs. It should also, and perhaps even more importantly, encompass a process dedicated to facilitating a meaningful dialogue with the investor. In this context, the reporting dimension of the framework should focus on updated probabilities of achieving investors' meaningful goals and associated expected shortfalls, as opposed to solely focusing on standard risk and return indicators, which are mostly irrelevant in this context.

At the risk of stating the obvious, let me again state the fact that institutional and individual investors alike are facing complex problems, emphasised by the aforementioned recent changes in the

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20 - This condition can be regarded as a necessary and sufficient condition for ensuring the protection of essential goals with probability 1.
retirement landscape, for which they need dedicated investment solutions, as opposed to off-the-shelf investment products.

These problems can be broadly summarised by the need to finance substantial levels of consumption with relatively limited dollar budgets (limited contributions from the beneficiaries and/or their sponsors) as well as relatively limited (regulatory- or self-imposed) risk budgets. Against this backdrop, I would propose the following definition of investment management as the art and science of efficiently spending investors’ dollar and risk budgets through a disciplined use of the three forms of risk management, namely risk hedging (for efficient control of the risk factors in investors’ liabilities/goals), diversification (for efficient harvesting of risk premia) and insurance (for securing investors’ essential goals while generating attractive probabilities of attaining their aspirational goals).

While each of these sources of value added is already used to some extent in different contexts, I argue that a comprehensive integration of all these elements within a comprehensive disciplined investment management framework is required for the design of meaningful investment solutions (see Bodie and Merton, 1995, for a discussion of the three forms of risk management and their relationship to the functions of the financial system).23

The Relationship between Dynamic Asset Pricing Theory and Goal-Based Investing
The True Start of the Industrial Revolution in Investment Management
The True Start of the Industrial Revolution in Investment Management

Mass production (in terms of products) happened a long time ago within investment management, through the introduction of mutual funds and, more recently, exchange-traded funds. I would argue that what will trigger the true start of the industrial revolution is instead mass customisation (as in customised solutions), which by definition is a manufacturing and distribution technique that combines the flexibility and personalisation of "custom-made" solutions with the low unit costs associated with mass production. The true challenge is indeed to find a way to provide a large number of individual investors with meaningful dedicated investment solutions.

Within Modern Portfolio Theory, mass customisation is trivialised: if investors' problems can be fully characterised by a simple risk-aversion parameter, then the aforementioned fund separation theorems state that all investors need to hold a specific combination of two common funds – one risky fund used for risk premia harvesting, and one safe (money market) fund.

In reality, different investors have different goals, as discussed above, and the suitable extension of the fund separation theorems implies that if the performance-seeking building block can be the same for all investors, the safe building block(s), which are known as goal-hedging portfolio(s) and are the exact counterparts in individual money management of LHPs in institutional money management, should be (mass) customised. Besides, the allocation to the safe rather than risky building blocks should also be engineered so as to secure investors' essential goals (e.g. target levels of replacement income).

That mass customisation is the key challenge that our industry is facing has long been recognised, but it is only recently that we have developed the actual capacity to provide such dedicated investment solutions to individuals. This point was very explicitly made by Merton (2003): "It is, of course, not new to say that optimal investment policy should not be "one size fits all". In current practice, however, there is much more uniformity in advice than is necessary with existing financial thinking and technology. That is, investment managers and advisors have a much richer set of tools available to them than they traditionally use for clients. (...) I see this issue as a tough engineering problem, not one of new science. We know how to approach it in principle (...) but actually doing it is the challenge."

Paraphrasing Robert Merton, I would like to emphasise that designing meaningful retirement solutions does not indeed require a new science.

I have actually argued in this paper that all the required ingredients are perfectly well-understood in the context of dynamic asset pricing theory (see for example Duffie, 2001), namely (1) a safe (goal-hedging) portfolio that should be truly safe; (2) a risky (performance-seeking) portfolio that should be well rewarded; and (3) an allocation to the risky portfolio that (3.i) reacts to changes in market conditions and (3.ii) secures investors' essential goals while generating a high probability of reaching aspirational goals. On the other hand, scalability constraints required to address mass customisation do pose a tough engineering challenge, since it is hardly feasible to launch a customised dynamic
allocation strategy for each individual investor. There are in fact two distinct dimensions of scalability – scalability with respect to the **cross-sectional dimension** (designing a dynamic strategy that can approximately accommodate the needs of different investors entering at the same point in time) and scalability with respect to the **time-series dimension** (designing a dynamic strategy that can approximately accommodate the needs of different investors entering at different points in time). The good news is that financial engineering can be used to meet these challenges – see Martellini and Milhau (2016) for a detailed analysis.26
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In closing, let me state that the magnitude of what is happening should not be underestimated. I do believe that our industry is truly about to experience somewhat of an industrial revolution within the next 5 to 10 years. We currently are at the confluence of historically powerful forces. On the one hand, liquid and transparent access to risk premia-harvesting portfolios is now feasible with smart factor indices, which are cost-efficient and scalable alternatives to active managers. On the other hand, distribution costs are bound to go down from their stratospheric levels as the trend towards disintermediation continues to accelerate, particularly through the development of FinTech and robo-advisor initiatives, which are putting the old business model under strong pressure, and forcing wealth management firms to entirely rethink the value that they are bringing to their clients.

Risk management, defined as the ability for investors, or asset and wealth managers acting on their behalf, to efficiently spend their dollar and risk budgets so as to enhance the probability of reaching their meaningful goals, will play a central role in this industrial revolution that will eventually lead to scalable, cost-efficient, investor-centric and welfare-improving investment solutions. Sophisticated financial engineering techniques have too often been used in the past to hide fees and risks within complex products that were sold to investors as safe and inexpensive products, and which were anyway entirely irrelevant with respect to investors' meaningful goals. It is about time that we use the same financial engineering techniques to help investors address the most important challenges they face, including the retirement financing challenge.

The combination of two relatively new ingredients is required for wealth and asset management firms to take an active role in this new investment paradigm. First, they should internalise the financial engineering expertise that is most commonly found in investment banking, namely the expertise needed to design state-contingent pay-offs and efficient dynamic replicating portfolios for these pay-offs. The convergence between investment management expertise, where a substantial amount of accumulated knowledge can be found about how to efficiently harvest risk premia, and investment banking expertise, where a substantial amount of accumulated knowledge can be found about how to efficiently structure underlying risk exposures, is a key central requirement for this industrial revolution to take place. Secondly, they should equip themselves with suitably designed distribution and reporting platforms and tools that will allow them to engage ex-ante and ex-post in a meaningful dialogue with asset owners – a dialogue centred on the time-varying probabilities of achieving investors' goals.

In the profound soul-searching process that is currently under way in investment management, I believe it is important for all parties involved to maintain a proper perspective and see what is happening as what it actually is, namely a unique opportunity for our industry as a whole to add value to society. Incidentally, asset and wealth managers willing and able to embrace this challenge will be able to grow a profitable business as they will start to address the needs of their clients more suitably.

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27 - Technically, this requires the use of Monte-Carlo simulations under the risk-neutral probability measure.
28 - This rather requires Monte-Carlo simulations under the historical probability measure, with a change in measure from historical to risk-neutral that involves risk premium estimates.
References
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About EDHEC-Risk Institute
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Founded in 1906, EDHEC is one of the foremost international business schools. Accredited by the three main international academic organisations, EQUIS, AACSB, and Association of MBAs, EDHEC has for a number of years been pursuing a strategy of international excellence that led it to set up EDHEC-Risk Institute in 2001. This institute now boasts a team of close to 50 permanent professors, engineers and support staff, as well as 36 research associates from the financial industry and affiliate professors.

The Choice of Asset Allocation and Risk Management and the Need for Investment Solutions
EDHEC-Risk has structured all of its research work around asset allocation and risk management. This strategic choice is applied to all of the Institute’s research programmes, whether they involve proposing new methods of strategic allocation, which integrate the alternative class; taking extreme risks into account in portfolio construction; studying the usefulness of derivatives in implementing asset–liability management approaches; or orienting the concept of dynamic "core-satellite" investment management in the framework of absolute return or target-date funds. EDHEC-Risk Institute has also developed an ambitious portfolio of research and educational initiatives in the domain of investment solutions for institutional and individual investors.

Academic Excellence and Industry Relevance
In an attempt to ensure that the research it carries out is truly applicable, EDHEC has implemented a dual validation system for the work of EDHEC-Risk. All research work must be part of a research programme, the relevance and goals of which have been validated from both an academic and a business viewpoint by the Institute’s advisory board. This board is made up of internationally recognised researchers, the Institute’s business partners, and representatives of major international institutional investors. Management of the research programmes respects a rigorous validation process, which guarantees the scientific quality and the operational usefulness of the programmes.

Six research programmes have been conducted by the centre to date:
• Asset allocation and alternative diversification
• Performance and risk reporting
• Indices and benchmarking
• Non-financial risks, regulation and innovations
• Asset allocation and derivative instruments
• ALM and asset allocation solutions

These programmes receive the support of a large number of financial companies. The results of the research programmes are disseminated through the EDHEC-Risk locations in Singapore, which was established at the invitation of the Monetary Authority of Singapore (MAS); the City of London in the United Kingdom; Nice and Paris in France.

EDHEC-Risk has developed a close partnership with a small number of sponsors within the framework of research chairs or major research projects:
• ETF and Passive Investment Strategies, in partnership with Amundi ETF
• Regulation and Institutional Investment, in partnership with AXA Investment Managers
• Asset-Liability Management and Institutional Investment Management, in partnership with BNP Paribas Investment Partners
• New Frontiers in Risk Assessment and Performance Reporting, in partnership with CACEIS
• Exploring the Commodity Futures Risk Premium: Implications for Asset Allocation and Regulation, in partnership with CME Group

Founded in 1906, EDHEC is one of the foremost international business schools. Accredited by the three main international academic organisations, EQUIS, AACSB, and Association of MBAs, EDHEC has for a number of years been pursuing a strategy of international excellence that led it to set up EDHEC-Risk Institute in 2001. This institute now boasts a team of close to 50 permanent professors, engineers and support staff, as well as 36 research associates from the financial industry and affiliate professors.
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- Asset-Liability Management in Private Wealth Management, in partnership with Coutts & Co.
- Asset-Liability Management Techniques for Sovereign Wealth Fund Management, in partnership with Deutsche Bank
- The Benefits of Volatility Derivatives in Equity Portfolio Management, in partnership with Eurex
- Structured Products and Derivative Instruments, sponsored by the French Banking Federation (FBB)
- Optimising Bond Portfolios, in partnership with the French Central Bank (BDF Gestion)
- Risk Allocation Solutions, in partnership with Lyxor Asset Management
- Infrastructure Equity Investment Management and Benchmarking, in partnership with Meridiam and Campbell Lutyens
- Risk Allocation Framework for Goal-Driven Investing Strategies, in partnership with Merrill Lynch Wealth Management
- Investment and Governance Characteristics of Infrastructure Debt Investments, in partnership with Natixis
- Advanced Modelling for Alternative Investments, in partnership with Société Générale Prime Services (Newedge)
- Advanced Investment Solutions for Liability Hedging for Inflation Risk, in partnership with Ontario Teachers’ Pension Plan
- Active Allocation to Smart Factor Indices, in partnership with Rothschild & Cie
- Solvency II, in partnership with Russell Investments
- Structured Equity Investment Strategies for Long-Term Asian Investors, in partnership with Société Générale Corporate & Investment Banking

The philosophy of the Institute is to validate its work by publication in international academic journals, as well as to make it available to the sector through its position papers, published studies, and global conferences.

To ensure the distribution of its research to the industry, EDHEC-Risk also provides professionals with access to its website, www.edhec-risk.com, which is entirely devoted to international risk and asset management research. The website, which has more than 70,000 regular visitors, is aimed at professionals who wish to benefit from EDHEC-Risk’s analysis and expertise in the area of applied portfolio management research. Its monthly newsletter is distributed to more than 1.5 million readers.

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EDHEC-Risk Institute: Key Figures, 2014-2015

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Research for Business
The Institute’s activities have also given rise to executive education and research service offshoots. EDHEC-Risk’s executive education programmes help investment professionals to upgrade their skills with advanced risk and asset management training across traditional and alternative classes. In partnership with CFA Institute, it has developed advanced seminars based on its research which are available to CFA charterholders and have been taking place since 2008 in New York, Singapore and London.

In 2012, EDHEC-Risk Institute signed two strategic partnership agreements with the Operations Research and Financial Engineering department of Princeton University to set up a joint research programme in the area of asset-liability management for institutions and individuals, and with Yale School of Management to set up joint certified executive training courses in North America and Europe in the area of risk and investment management.

As part of its policy of transferring know-how to the industry, in 2013 EDHEC-Risk Institute also set up ERI Scientific Beta. ERI Scientific Beta is an original initiative which aims to favour the adoption of the latest advances in smart beta design and implementation by the whole investment industry. Its academic origin provides the foundation for its strategy: offer, in the best economic conditions possible, the smart beta solutions that are most proven scientifically with full transparency in both the methods and the associated risks.
EDHEC-Risk Institute Publications (2013-2016)

2015
• Amenc, N., G. Coqueret, and L. Martellini. Active Allocation to Smart Factor Indices (July).
• Goltz, F., and V. Le Sourd. Investor Interest in and Requirements for Smart Beta ETFs (April).
• Amenc, N., F. Ducoulombier, F. Goltz, V. Le Sourd, A. Lodh and E. Shirbini. The EDHEC European Survey 2014 (March).
• Blanc-Brude, F., and M. Hasan. The Valuation of Privately-Held Infrastructure Equity Investments (January).

2014
• Loh, L., and S. Stoyanov. The Impact of Risk Controls and Strategy-Specific Risk Diversification on Extreme Risk (August).
• Blanc-Brude, F., and F. Ducoulombier. Superannuation v2.0 (July).
• Loh, L., and S. Stoyanov. Tail Risk of Smart Beta Portfolios: An Extreme Value Theory Approach (July).
• Foulquier, P. M. Arouri and A. Le Maistre. P. A Proposal for an Interest Rate Dampener for Solvency II to Manage Pro-Cyclical Effects and Improve Asset-Liability Management (June).
EDHEC-Risk Institute Publications
(2013–2016)

- Ducoulombier, F., F. Goltz, V. Le Sourd, and A. Lodh. The EDHEC European ETF Survey 2013 (March).
- Deguest, R., and L. Martellini. Improved Risk Reporting with Factor-Based Diversification Measures (February).

2013
- Deguest, R., L. Martellini, and A. Meucci. Risk parity and beyond – From asset allocation to risk allocation decisions (June).
- Blanc-Brude, F., Cocquemas, F., Georgieva, A. Investment Solutions for East Asia’s Pension Savings - Financing lifecycle deficits today and tomorrow (May)
- Blanc-Brude, F. and O.R.H. Ismail. Who is afraid of construction risk? (March)
- Deguest, R., L. Martellini, and V. Milhau. The benefits of sovereign, municipal and corporate inflation-linked bonds in long-term investment decisions (February).
EDHEC-Risk Institute Publications (2013-2016)

• Cocquemas, F. Towards better consideration of pension liabilities in European Union countries (January).
• Blanc-Brude, F. Towards efficient benchmarks for infrastructure equity investments (January).
EDHEC-Risk Institute Position Papers (2013-2016)

2014
• Blanc-Brude, F. Benchmarking Long-Term Investment in Infrastructure: Objectives, Roadmap and Recent Progress (June).
For more information, please contact:
Carolyn Essid on +33 493 187 824
or by e-mail to: carolyn.essid@edhec-risk.com

EDHEC-Risk Institute
393 promenade des Anglais
BP 3116 - 06202 Nice Cedex 3
France
Tel: +33 (0)4 93 18 78 24

EDHEC Risk Institute—Europe
10 Fleet Place, Ludgate
London EC4M 7RB
United Kingdom
Tel: +44 207 871 6740

EDHEC Risk Institute—Asia
1 George Street
#07-02
Singapore 049145
Tel: +65 6438 0030

EDHEC Risk Institute—France
16-18 rue du 4 septembre
75002 Paris
France
Tel: +33 (0)1 53 32 76 30

www.edhec-risk.com