EDHEC PhD in Finance

N E W S L E T T E R

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In this issue:

Longevity Risk Models

Russell G. Nel, EDHEC PhD in Finance graduate (2016), EDHEC-Risk Institute Research Associate, Founder and Chief Executive Officer of Zaseca Capital, South Africa.

While increasing longevity appears to be a valuable social goal, it carries substantial financial risk both at a personal level and at a society level. Continued aggregate annual longevity increases are expected to generate several trillion USD of incremental liabilities to public and private sectors.

Traditional mechanisms designed to manage these risks include life annuities (individuals), defined benefit plans (corporates) and social security systems (government agencies). Despite the size and diversification underlying these structures, macro-longevity risk continues to present increasingly significant financial risk to the private and public sectors for the foreseeable future. Additionally, the phasing out of defined benefit plans by the private sector transfers a portfolio of complex market and longevity risk to individuals, who are generally not skilled to either quantify or manage retirement investment portfolios containing these sources of risk.

Capital markets would ideally provide governments, corporations, and individuals with efficient means of transferring longevity risk. Sellers of longevity risk would seek customised hedge contracts in order to maximise the effectiveness of risk transfer, whereas buyers would seek standardised asset pricing methodologies and instruments in order to maximise liquidity. Standardised micro-longevity modelling (providing the tools required to quantify and manage basis risk) and efficient longevity capital market platforms are required to expand longevity risk transfer markets.

Actuarial academic literature provides numerous macro-longevity risk modelling approaches, incorporating stochastic mortality models, which utilise age-specific data, controlling for gender and smoking status of individuals comprising the cohort. However, the retirement age cohort is largely enumerated by multiple chronic impaired-health conditions, which requires an integrated epidemiological modelling approach in order to

correctly specify longevity heterogeneity features of the cohort under consideration. Moreover, the pricing of longevity indexed assets cannot be estimated easily from spot yield curves and zero arbitrage methods since this market is inherently incomplete, leaving us with a myriad of equivalent martingale measures consistent with the presence of arbitrage. The dissertation attempts to unravel these key issues with a mathematical modelling approach that is located at the intersection of actuarial, epidemiology and finance theory by constructing a multi-state stochastic longevity data generating process "n-State Longevity DGP".

In the first chapter, we start from the premise that idiosyncratic impaired-health states, in the age cohort exceeding 65 years, is a crucial clinical variable required to profile individual life expectancy with subsequent valuation and risk management implications. We propose to characterise impaired-health states as a time-varying absorbing Markov process, used to describe impaired-health progression as a series of probable transitions between health states. Raw clinical data (dementia) and age-specific mortality data dictate a 7-State Markov chain containing five transient states and two absorbing (death) states. The Markov representation maps expected transition pathways for an individual transitioning from a standard-health state through the various stages of dementia and finally to the absorbing state. The absorbing state can either be reached from a standard-health state or from any of the impaired-health states. Transition rate parameters (transition rates and state conditional probabilities) are estimated with Bayesian statistical techniques, calibrated to standard age-specific mortality data and clinical dementia impaired-health data. Bayesian posterior probability densities for each parameter (spanning varying ages and health-states) achieved convergence to the stationary distribution, after 20,000 simulations with a 10,000 simulation burn-in level within a 95% credible interval range. Resulting transition probabilities based on the simulated parameters and Kolmogorov equations, comprise the elements of the fundamental stochastic matrix representing the Markov process and provide the basis for generating the system longevity properties. The key statistical properties precipitated from this methodology include the number of visits to transient states, time to absorption (life expectancy) and conditional probability distributions (absorption and survival).

Figure 1 and **Figure 2** below reflect two statistical properties recovered from the n-State Longevity DGP and compares these results to the standard-health, age-specific modelling approach.

Figure 1: Cumulative Survival Probabilities at Age 65, standard age-specific model versus n-State Longevity DGP

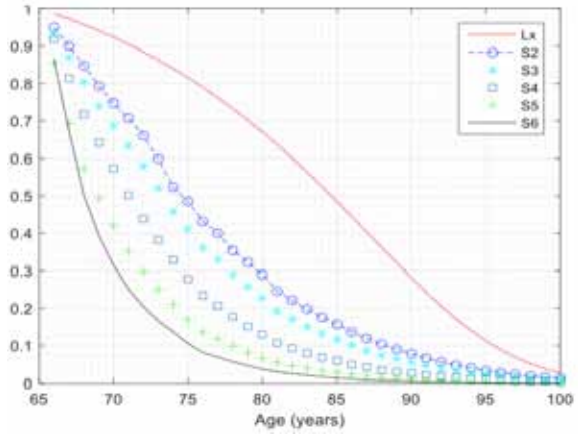
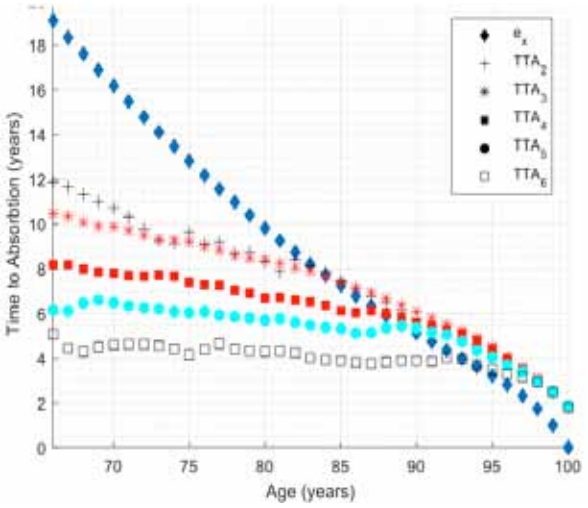


Figure 2: Time to Absorption (Life Expectancy), standard age-specific model versus n-State Longevity DGP



The results show that the cumulative survival probabilities and time to absorption (life expectancy) statistical quantities decrease with increasing age and transitions to higher order impaired-health states, confirming intuitive expectations. Market price of risk ("MPR") associated with life-contingent asset pricing is recovered by distorting the risk-free probability distribution (age-specific probability distribution) with a market price of risk parameter in order to obtain a risk-adjusted probability distribution (n-State Longevity DGP). Figure 3 and Figure 4 depict the valuation of a life contingent claim and associated market price of risk as function of varying age and incremental impaired-health states of the individual.

Figure 3. Life Settlement Contract Pricing

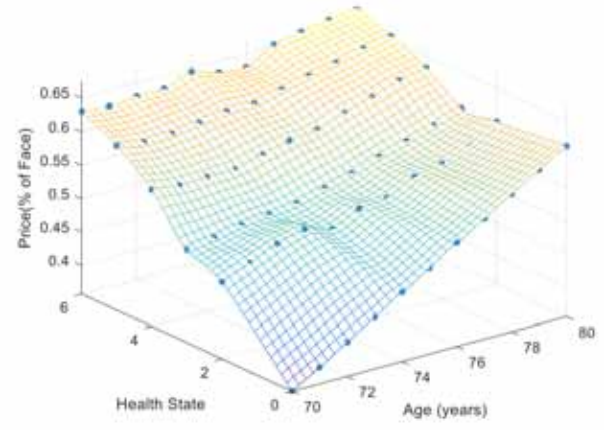
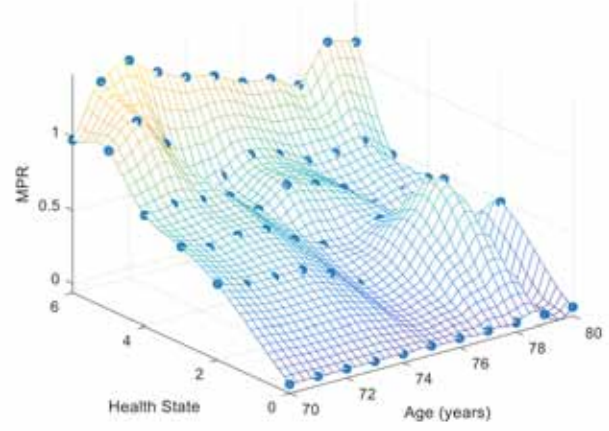


Figure 4. Market Price Of Risk



Key empirical results show that when impaired-health states are imposed, asset valuations can differ by up to 27% with Sharpe ratio's ranging between 0.49-1.12 versus benchmark assets Sharpe ratio range of between 0.21-0.72.

Another chapter posits a strategy in which the Investor, on the retirement date, will have accrued retirement assets and hold a portfolio of life policies. Conditional on survival to the next period, holders of life policies, with access to the life settlement secondary market, effectively own a predetermined fixed floor (cash surrender value) and an option on impaired-health states. The research hypothesises that latent health-state options ("HSO"), owned by life policy holders can be exercised in the secondary life settlement market with subsequent substantial investor welfare gains. The research objective is achieved by modelling and comparing various decumulation strategies reflecting exposure to longevity risk, impaired-health state risk and capital market risk with allocation decisions to consumption, market portfolio choice and life annuities. The strategy dimensions include health states, insurance holdings and heuristic market portfolios. Although the determination of the optimal strategy is not addressed, due to the high dimensionality of the problem, the analysis provides interesting results by using relevant benchmark asset allocations as yardsticks, and explains how the possibility of monetising health states in the life settlement market could deliver substantial utility gains. Key empirical results derived from state-space simulations show that the proposed HSO strategy outperforms benchmark allocation strategies for all state-variables, allocation decisions, and heuristic portfolio choice. Figure 5 and Figure 6 below compare the implementation of the HSO strategy for immediate versus gradual annuitisation on the utility of wealth and consumption (household liquidity) variables.

Figure 5: Wealth (A=100% / 15%; HSO=0/1)

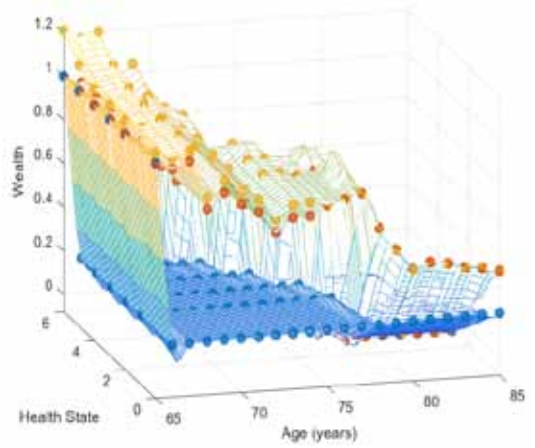
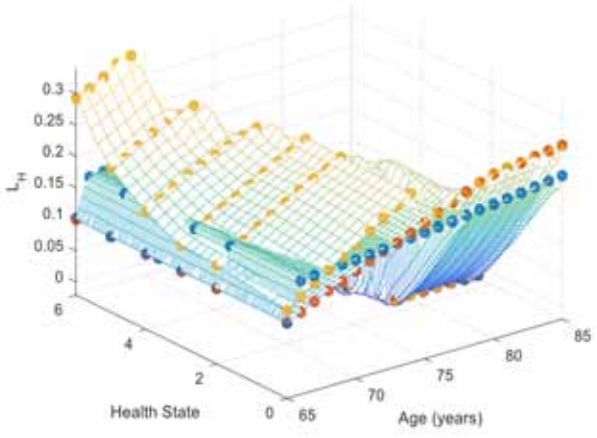


Figure 6: Household Liquidity (A=10% / 15%; HSO=0/1)



Empirical results show that the HSO strategy delivers monotonically increasing value with increasing age and exponentially increasing value with increasing impaired-health states.

In conclusion, our work on the n-State Longevity DGP generates rich conditioning of transition probabilities, which include age, impaired-health states and starting impaired-health state. This approach provides a granular tailoring of valuation and risk management models for life-contingent claims (e.g. life settlements, reverse mortgages, life annuities). Longevity properties generated with the n-State Longevity DGP (causal variables) bear significant implications for asset pricing and asset allocation decisions in the decumulation phase of the life-cycle. Macro-longevity modelling, utilising period life table data (explanatory variables) is likely to be less accurate in estimating longevity risk, which may explain the consistent under-estimation of longevity in every recent decade when actuarial life tables are updated.

Russell G. Nel, PhD (2016), who signs this editorial, successfully defended his thesis, "Introducing State Contingencies in Longevity Risk Models with n-State Stochastic Longevity Data Generating Process - Applications to Asset Pricing of Life-Contingent Claims and Decumulation Phase Asset Allocation", on 26 April 2016 on the Nice campus. Thesis committee: Professors Enrico Biffis (Imperial College), René Garcia and Lionel Martellini (EDHEC Business School).

Faculty and student interviews

FACULTY INTERVIEW: Federico Bandi

EDHEC PhD in Finance Affiliate Faculty member Federico Bandi

Federico Bandi is currently a Professor at Johns Hopkins Carey Business School. He has been an affiliate professor in the EDHEC PhD in Finance since the beginning of the programme in 2008. He shares his expertise in the areas of financial econometrics, continuous-time asset pricing, and empirical market microstructure.

What are your current research themes and could you share a bit about your findings?

I have been working on a number of projects. Those which have more relevance for the finance community are about the measurement of the degree of illiquidity using high frequency data and the role of frequency (or the horizon) in asset pricing. Regarding the former issue, it is well-accepted that observed prices deviate from true or fundamental values. The deviations are imputed to the functioning of markets. Many would call the functioning of markets their "microstructure" and the price deviations "microstructure noise". Much influential work in the literature has focused on learning about features of the fundamental price (for example, the volatility of the fundamental price changes) when fundamental prices are unobserved and contaminated by noise. This work effectively purges observed prices of their noise component in order to reveal fundamental counterparts. Important economic information, however, is also contained in what we have been aiming at eliminating, i.e. "noise". If "noise" is induced by the very nature of market operations, its study should tell us something useful about critical features of these operations, like the extent of liquidity or asymmetries in the way in which information is processed by various

market participants. In work with co-authors, I show that this is indeed the case. Regarding the latter issue, I have always felt that the reason why certain canonical relations in finance do not seem to hold in the data is that they may apply to slow-moving components of the time series of interest but may be blurred when looking at the raw series because of short-term, transient effects. Think about the highly-advertised relation between the expected excess return that the market should provide with respect to riskless securities and a forecast of market variance over the same period. If variance risk is compensated, the market expected excess return should depend on market variance forecasts. It is unclear that it does so when using raw data. However, when focusing on slow-moving components of excess market return and variance series, the relation becomes considerably stronger. One could also say that the relation becomes stronger when analysing the relation at low frequencies, namely those over which a persistent signal emerges and transient perturbations have less bite.

As part of the programme's doctoral workshop series, you presented a working paper titled "The scale of Predictability", which studies and formalises the link between scale-specific predictability and aggregation; could you tell us about this paper and its key insights?

As I just indicated, slow-moving components of a specific process may matter for the purpose of predicting stock returns (and other finance problems) while transient dynamics may not. These slow-moving components can be filtered out. Alternatively, well-defined aggregation can be put to work as a way to extract predictive signal and reduce transient noise. The paper formalises the extraction (i.e. the filtering) of the priced slow-moving components and the role of explicit aggregation as an alternative way to conduct that extraction.

How is your research relevant to practitioners?

Both the work on liquidity and the work on frequency and asset pricing have uncovered interesting predictability patterns, whereby predictability I mean the ability of suitably defined variables to predict market returns over different horizons. This should be of interest to anybody engaged in asset allocation. The most popular predictor for market returns is the dividend-to-price ratio. It is well-known that this ratio should, in principle, either predict future returns or future dividend growth or both. In the data, it only seems to predict future returns. Any variable uncorrelated with the dividend-to-price ratio which is capable of predicting long run returns (and therefore adding to the predictive ability of the dividend-to-price ratio) should, instead, also predict long run dividend growth. We have identified variables that satisfy both properties (return and dividend growth predictability). These variables have the potential to add substantially to forecasting models for future market returns and lead to more effective asset allocation.

Since the inception of the programme, you have regularly delivered a doctoral research seminar entitled "The Econometrics of Continuous-Time Models"; what did you cover in this seminar?

The seminar covers the estimation of nonlinear models by virtue of parametric and nonparametric methods. We discuss the mathematics of the various approaches as well as important finance applications. While the emphasis is on models written in continuous time, I first present all methods in discrete time. The methods are then adapted to a continuous-time environment by illustrating issues that are specific to the fine-grain structure of processes assumed to evolve continuously in time. I have found that the format is helpful for all constituencies of students, i.e. those with strong applied interests (whose main focus will likely be the estimation of discrete time specifications) as well as those who appear to be more drawn to theory (for whom some familiarity with continuous-time techniques appears important).

How is teaching in such a programme different from what a scholar experiences in traditional PhDs?

There are two main differences. First, the course structure is that of executive programmes (with a large number of hours concentrated in just a few days) and students are full-time professionals with limited amount of time outside of the classroom. Because of these realities, I tend to be a lot more detailed in class than I would be if the course allowed for (possibly) the same number of hours spread out over several weeks. The flip side of me showing every step in class is that I probably cover fewer topics than I would under a more traditional structure. My goal, however, is to give students depth in important topics and help them operationalise them in a short amount of time. The second difference has to do with the very nature of the student population. It has been an absolute pleasure teaching students with a broad range of professional experiences and achievements. I feel that I have learned from them more than I have been able to teach them.

Did you have reservations about this programme's being open to executives?
On the contrary, I have always felt that this was the strength of the programme. I have been thoroughly impressed by the ability of the school to recruit programme participants with the right determination and technical skills to belong in a vibrant PhD programme, as well as with a rich array of professional backgrounds. This mix is rather unique and, from the view point of faculty, quite exciting.

What advice could you give to PhD students looking to identify a suitable/relevant topic for their research work?
My first piece of advice to any PhD student looking to identify a suitable topic is to work on a timely subject that makes you passionate. Research is, for the most part, a lonely endeavour, and one that often keeps you awake around the clock. Unless you are passionate about what you are working on, you are in for a rather rough ride. My second piece of advice is to place emphasis on the process, rather than on the outcome. Write your best work with passion and then think about publishing it. Publishing should not be your driver. Third, do not choose a topic just because it is an open issue in the literature. There is a reason why certain issues should remain "open"... Be selective.

As co-editor of the *Journal of Financial Econometrics* and associate editor for several journals, what advice can you offer to researchers who target the best journals for publication?
If targeting top journals means writing a paper with a pre-defined idea of what should please a specific editor, I would certainly think that targeting is a bad idea. Again, very simply and somewhat trivially, we should all just be aiming at producing our best work. Once the paper's results are in place, one may consider making adjustments to address the editorial style of a specific outlet deemed to be suitable for the research in question. This is the only form of targeting that I would advocate. In the end, while "good" papers often (not always) get into good journals, they are generally always recognised as "good". This is all that matters. Finally, there should be an understanding that even the best editorial processes have an element of uncertainty to them. Once more, it is important to draw satisfaction from the process of writing not just from publishing. This is particularly true when working on risky projects which may increase that element of uncertainty and result in a more complex review process.

ALUMNI INTERVIEW: Matt Lanfear and Mark Siebert

Matt Lanfear, Restructuring and Turnaround Advisor, British

Mark Siebert, Head of Specialised Finance, North America at National Australia Bank, Australian

Could you tell us about your background and your current job?
Mark Siebert (MS): I started my working life as a Petroleum Geophysicist in Adelaide, Australia. I moved into Finance in 1990 as a financial analyst with a New Zealand-owned investment bank which specialised in oil and gas finance. Then I moved to Melbourne to join the project finance team at National Australia Bank (NAB). I now run the North American Infrastructure Finance team for NAB based in New York. I have undergraduate degrees in Geophysics, Mathematics and Wine Science and a MSc of Applied Finance from Macquarie University, Australia.
Matt Lanfear (ML): After university, I trained as a Chartered Accountant with Coopers & Lybrand (now PwC) in London. I then undertook an international secondment to Zürich, Switzerland, where I was a consultant for international corporate finance advisory mandates spanning mergers and acquisitions, valuation, private equity and restructuring. I remained in Switzerland and subsequently held Corporate Finance and M&A positions in two Swiss-based multinationals, and later senior management positions within banks. I have been an Independent Consultant for the past six years, and my activities are primarily focused on restructuring and corporate turnarounds, providing a combination of strategic and operational financial advice to firms. I have an undergraduate degree in Physics from the University of Reading, and the Global Executive MBA from IESE Business School.

Why did you feel that you needed to do a PhD at this stage of your career?
MS: I have always enjoyed the theory side of finance having studied Mathematics as an undergraduate degree and completed a postgraduate Masters in Finance. I felt the need to extend the theory side by undertaking the PhD, a more personal motivation rather than a career choice.

ML: I am passionate about self-development and committed to life-long learning. Every ten years following my undergraduate degree I have undertaken further formal education (whilst working), first with my MBA and then later the PhD. The PhD was not a requirement to progress in my "day-job", rather it was a personal ambition. I hope also that the PhD, in conjunction with industry experience, opens the doors for future opportunities as adjunct finance faculty at a business school.

Why did you choose this particular programme?
MS: EDHEC was one of the few highly recognised institutions that offered an Executive track PhD in Finance designed for full-time working students.
ML: I came across the EDHEC PhD in Finance through an advert in the Economist magazine when the programme was first launched in 2008. I was curious about the programme – the academic content appeared diverse and cutting-edge. The modular format of the programme was essential to my decision to apply, since I did not wish to stop working to study full-time as is often the case with traditional PhD programmes. The reputation of the core and affiliate faculty, combined with the industry-standing of EDHEC-Risk Institute, provided assurance of the programme's rigour.

What was your experience of the three-year programme and did you experience any "Aha!" moments during this period?
MS: The experience has been very positive. I have had the opportunity to make a host of new contacts from a diverse range of backgrounds, experiences, cultures and industries. The quality, experience and reputation of the permanent and visiting staff are big plus points. The "aha" moment is how highly people in the "market" respect the qualification and the dedication and work ethic required to complete the course.
ML: The programme is a phenomenal learning experience. The academic content is up-to-date and well-delivered both in person and also remotely via the online platform, and the quality of the participants outstanding. The programme starts with the core courses, which provide a common theoretical foundation in corporate finance, financial economics and empirical research methodology. I found the elective courses, in particular, extremely stimulating and the affiliate faculty – coming from leading academic institutions in the U.S., across Europe and elsewhere – outstanding. It is a programme requirement to undertake a minimum of five electives – in the end, I completed twelve, covering topics as diverse as: hedge funds and private equity, volatility modelling, behavioural finance, risk management of extreme risks, empirical option pricing, data science, predictive modelling and forecast evaluation, and high-frequency asset pricing, among others.

The quality and professional diversity of the participants is extremely high, with many people already holding advanced degrees, MBAs and professional qualifications, as well as impressive career progression. In addition to one's own classmates, there is also the opportunity to meet other cohorts during the elective courses, further expanding the scope for networking.

The "aha" moments come when one sees a particular piece of financial theory applied in alternative contexts across the different elective courses. Seeing complex theory applied in different settings reinforces one's understanding of it – and in some cases, something that was not fully absorbed when first encountered, becomes clear when seen later from a different perspective.

What was the main challenge in the programme?
ML: A significant time commitment is required to complete the programme. In the first year, time may be required to dust-off knowledge that has become rusty – particularly the mathematics required for the Continuous-Time Financial Economics course – and learning new skills such as coding in R or MATLAB. The doctoral dissertation itself requires a huge effort to develop and shape an original idea, and then persistence to bring the research to a successful conclusion. There is a huge volume of material to digest throughout the programme – literally hundreds of academic papers to read – so making use of the appropriate tools to streamline one's workflow is essential.

Ultimately, juggling one's professional responsibilities and personal commitments with the doctoral studies is the main challenge. It is important to have an understanding and supportive partner / family-environment in order to succeed in this endeavour.
MS: When you sign up for the courses, you don't actually realise the level of time commitment required of you; it is tremendous but it is very rewarding.

How did the programme impact your daily work?
MS: The programme has provided a platform to view challenging work projects in a different light. The theory side of the programme has helped in many aspects of the risk component of my work.

ML: A PhD develops rigour in one's conceptual thinking and analysis of data. For me personally, the programme reflects my philosophy of constantly questioning, constantly learning so as to extend my limits, as well as create future opportunities.

Do you think there are benefits to having a majority of professionals in the class?
ML: A broad range of finance professionals are represented on the programme: hedge fund and asset managers, investment bankers, actuaries, consultants and entrepreneurs, among others. Most are mature students with significant and diverse experience, which makes for stimulating discussions both in and beyond class. Going through an intensive and shared experience with the PhD develops strong relationships with one's classmates and broadens one's professional network.
MS: Absolutely – it is one of the key attractive features of the programme.

You have just defended your theses, partly co-written; could you please introduce the topics and the results of your research work?
MS: My topic is titled "Is Climate Change Affecting the Stock Market?". Our research is motivated by the need to better understand how the stock market reacts to major extreme weather events, both in the days leading up to the event, as well as the immediately succeeding period. This is particularly pertinent given that scientists are predicting an increase in the frequency and intensity of extreme weather events due to climate change. Our research focuses on the inter-relationship between the three key factors which influence investment decisions, being returns, risk (volatility) and liquidity, and how they respond to the impact of an extreme weather event.
ML: My dissertation is titled "Extreme Weather Events and Financial Markets" and examines how North Atlantic hurricanes impact stock returns and idiosyncratic volatility across the broad range of industries that comprise the aggregate U.S. stock market. The research further investigates how the abnormal effects identified vary with the firm characteristics used to construct the factors used in standard asset pricing models.

You were the first candidates in the programme who co-authored part of their theses, and come from Australia and Switzerland; did you know each other when you joined the programme?
MS: No, we met for the first time on day one in Singapore, we happened to sit beside each other in the front row.
ML: It's purely a coincidence that Mark and I ended up next to each other.

How did you decide to work together?
MS: I think that neither of us had an idea of what the thesis topic would be at the beginning. We did some of the assignments together and for some of them groups of three students were allowed, so we worked also with another student. We also had various conversations on extreme weather having an impact on financial markets and we chose to work together on this topic.
ML: It just seemed natural and worked very well. I believe it was more chemistry than complementarities. Of course, over time we identified areas of strength in each of us that we leveraged optimally.

When you identified your thesis topic, how were you organised? Did you decide to share the task?
MS: It is interesting because Matt is in Switzerland and at that time I was in Australia before going to Singapore. In fact, being in different time zones was a positive factor. When we finished a piece of work we will Skype so the other can take over and continue developing the work, and so back and forth almost every day. I particularly enjoyed the statistics, maths and coding, while Matt was very good on the research and shaping the idea, but we really shared the work load fairly.
ML: Being in different time zones meant that we were able to maximise our working day. We spoke to each other almost every day over the past two and a half years. Such a continuous exchange is very beneficial to maintaining momentum. When you are two, you can keep each other motivated through the inevitable roller-coaster of highs and lows of such a long-term project. Remote working extends also to the supervision – we did not need to physically be with our thesis advisor, Abraham Lioui, to benefit from his supervision; through regular Skype sessions we were able to have a very efficient interaction.
MS: I think that's right. If you're working with a fellow student, you can share your successes and your frustrations, bounce ideas off each other. You need a good relationship otherwise it is not going to work; for a co-authored thesis, you have to write four papers between the two of you and you constantly share the work.
ML: There are also many informal learning and networking opportunities. You learn not only from your classmates, but also those cohorts ahead of and behind you, whom you meet at the elective seminars. You build relationships when physically together

during these weeks, which endure throughout the programme and beyond.

You have now completed your thesis? What is your next step?

ML: We've been working with Abraham on the publication versions of the papers. Before submitting the papers, we are reorganising the thesis chapters to streamline the main contributions, and we will then target leading journals for publication.

MS: When you get to the end of the journey, you look back on everything you've done and you try to bring it together in a more focused manner.

Do you intend to continue doing research or start teaching in the future?

ML: I spent the first 18 years of my career in professional services firms, large corporates and banks, and I have been an independent consultant for the last six years. My strategy for the next 20 years is to create a portfolio career comprising three pillars: consulting; entrepreneurial activities; and academia, as a fellow researcher or adjunct faculty. The combination of my particular industry experience and the EDHEC PhD in Finance would naturally lead me to teach topics such as corporate finance, valuation, and mergers & acquisitions to MBA students.

MS: I am coming to the end of my working career. I've been with the bank 23-24 years and in finance for about 30 years, so I am looking for new opportunities; I enjoy studying and research. There are opportunities within the bank that I currently work for to be the bank's representative for a project on infrastructure within one of the Australian universities we have affiliation with. This is quite an interesting project that may involve me for the next 3 years. If there is an opportunity to become a fellow researcher I would of course welcome it.

Programme and faculty news

The programme welcomes two new faculty members

Professor Laurent Calvet will join EDHEC Business School early September 2016

A specialist in asset pricing, household finance, and volatility modelling, **Laurent E. Calvet** will join EDHEC Business School and the EDHEC PhD in Finance core faculty at the beginning of September 2016.

Laurent Calvet is an engineering graduate from Ecole Polytechnique in Paris and holds a PhD in Economics from Yale University. He is a Research Fellow and a founding member of the Household Finance Network at the Center for Economic Policy Research (CEPR). Prior to joining EDHEC, Laurent Calvet served as the John Loeb Associate Professor of the Social Sciences at Harvard University, was a Professor in Finance at HEC Paris (2004-2016), and a Professor and Chair in Finance at Imperial College London. He has received numerous research grants and awards including the "Best Finance Researcher under the Age of 40" award from Le Monde and the Europlace Institute of Finance (2006).

His research has appeared in leading economics and finance journals such as *American Economic Review*, *Journal of the American Statistical Association*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of Political Economy*, and *Quarterly Journal of Economics*.

Laurent Calvet pioneered, with Adlai Fisher, the Markov-Switching Multifractal model of financial volatility, which is increasingly used by financial practitioners and central banks to forecast volatility, compute value-at-risk, and price derivatives. This approach is summarised in their book "Multifractal Volatility: Theory, Forecasting and Pricing".

Professor Calvet is going to teach Empirical Methods in Finance and will advise PhD in Finance candidates of the programme.

Professor **Riccardo Rebonato**, a specialist in interest rate risk modelling with applications to bond portfolio management and fixed-income derivatives pricing, has joined the EDHEC PhD in Finance core faculty and EDHEC-Risk Institute in May 2016.

EDHEC PhD in Finance Core Faculty member Professor Riccardo Rebonato

Riccardo Rebonato was previously Global Head of Rates and FX Research at PIMCO. He also served as Head of Front Office Risk Management and Head of Clients Analytics, Global Head of Market Risk and Global Head of Quantitative Research at Royal Bank of Scotland (RBS). Prior to joining RBS, he was Head of Complex IR Derivatives Trading and Head of Head of Derivatives Research at Barclays Capital. Riccardo Rebonato has served on the Board of ISDA (2002-2011), and has been on the Board of GARP since 2001. He was a visiting lecturer in Mathematical Finance at Oxford University from 2001 to 2015.

He is the author of several books, in particular having published extensively on interest rate modelling, risk management, and most notably books on SABR/LIBOR Market Model pricing of interest rate derivatives, as well as on the use of Bayesian nets for stress testing and asset allocation. He has published articles in international academic journals such as *Quantitative Finance*, the *Journal of Derivatives* and the *Journal of Investment Management*, and has made frequent presentations at academic and practitioner conferences.

He holds a doctorate in Nuclear Engineering (Universita' di Milano) and a PhD in Science of Materials (Condensed Matter Physics, Stony Brook University, NY).

Riccardo Rebonato will deliver a doctoral research seminar workshop entitled "Term Structure Modelling in the P and Q Measures" to the PhD participants in their second or third academic year on the EDHEC executive campus in London in January 2017.

Six new alumni for the programme

The past three months, six PhD candidates successfully defended their theses; their research work provides new insight into predictability of returns and volatility, asset pricing, fixed income derivatives pricing, private equity, market microstructure and corporate finance...

Jakob Von Ganske, PhD, Vice President, Investment Consulting and Risk Management , Deutsche Oppenheim Family Office AG (Germany)
"***Forecasting Equity Returns and Volatility with Regime-Switching Partial Least Squares***"
Supervisor: René Garcia, EDHEC Business School
External reviewer: Roméo Tédongap, ESSEC Business School
Other committee member: Abraham Lioui, EDHEC Business School

Russell Nel, PhD, Founder & Chief Executive Officer, Zaseca Capital (South Africa)
"***Introducing State Contingencies in Longevity Risk Models with n-State Stochastic Longevity Data Generating Process - Applications to Asset Pricing of Life-Contingent Claims and Decumulation Phase Asset Allocation***"
Supervisor: Lionel Martellini, EDHEC Business School
External reviewer: Enrico Biffis, Imperial College London
Other committee member: René Garcia, EDHEC Business School

Rodney Hoskinson, PhD, Manager, Quantitative Analysis (FICC Capital & Collateral), National Australia Bank (Australia)
"***Multiple Curves and Multiple Regimes: Libor Market Models on Switching (co-Jump) Diffusions***"
Supervisors: Frank Fabozzi, EDHEC Business School, Jakša Cvitanic, Caltech
External reviewer: Marcel Rindisbacher, Boston University
Other committee member: René Garcia, EDHEC Business School

Sue Wan Chua, PhD, Consultant (Treasury), Hong Kong Jockey Club (Hong Kong)
"***Performance Evaluation and Persistence in Private Equity***"
Supervisor: Florencio Lopez-de-Silanes , EDHEC Business School
External reviewer: Ludovic Phalippou, University of Oxford
Other committee member: René Garcia, EDHEC Business School

François Cocquemas, PhD, FMRC Visiting Scholar, Vanderbilt University, Owen Graduate School of Management (USA)
"***Essays in Asset Pricing and Market Microstructure***"
Supervisor: Abraham Lioui, EDHEC Business School,
External reviewer: Robert Whaley, Vanderbilt University
Other committee member: René Garcia, EDHEC Business School

Marco Ghitti, PhD, Equity Partner-Head of Corporate Finance, SGEA - Studio Ghitti and Associati (Italy)
"***Bankruptcy Law Reforms and Enforcement: consequences on Bank Credit for SMEs***"
Supervisor: Florencio Lopez-de-Silanes, EDHEC Business School
External reviewer: Erasmo Giambona, University of Amsterdam
Other committee member: Abraham Lioui, EDHEC Business School

In the course of the first academic year, the programme director and core faculty team help each participant identify a suitable topic and dissertation adviser. Selecting a dissertation topic that corresponds to areas of professional expertise and echoes actual problems faced by the candidate's organisation goes a long way toward optimising the time spent on dissertation work. Close individual work with faculty is an important part of the programme's research coaching approach.

The dissertation adviser is a world-class scholar selected for his or her expertise in the candidate's field of specialisation, and is responsible for advising the candidate throughout the research process, from the choice of elective seminars to the dissertation defence.

A list of the dissertations that have been produced since the beginning of the EDHEC PhD in Finance programme is available **here**.

A selection of recent and forthcoming presentations:

IMCA 2016 Advanced Investment Strategist Institute

IMCA's first "Advanced Investment Strategist Institute: Portfolio Construction and Investment Risk Management" conference took place on 13-14 June 2016 in Toronto. Speakers included academics and practitioners. **Lionel Martellini**, Director of EDHEC-Risk Institute and Professor of Finance at EDHEC Business School, spoke on the theme of «Goals-Based Investing: From Investment Products to Investment Solutions». He spoke about how individual and institutional investors need investment solutions that help them meet their goals subject to dollar and risk-budget constraints. The investment industry needs to evolve beyond standard product-based, market-centred approaches and to start providing both institutions and individuals with meaningful investor-centric investment solutions. In this masterclass, Lionel Martellini introduced participants to the modern financial-engineering and risk-management techniques to design and implement innovative forms of welfare-improving investment solutions for clients. He showcased how the emergence of these new forms of investment solutions is a profound paradigm change that will disrupt the wealth management industry, where existing practices still rely on costly attempts at summarising investors' preferences in terms of risk-aversion (balanced funds), time-horizon (target-date funds), or capital guarantee (structured products). Combining academic expertise and industry experience, Professor Martellini strikes a balance between exploring new investment approaches and analysing practical applications, including integrative case studies that provide step-by-step implementation examples.

Ninth Annual SoFiE Conference

Professor **René Garcia**, EDHEC PhD in Finance programme director and Professor of Finance at EDHEC Business School gave the Halbert White Jr. Memorial JFCE Invited Lecture at the 9th Annual SoFiE (The Society for Financial Econometrics) Conference in Hong Kong on 15-17 June 2016. He presented a paper entitled "Nonparametric Tail Risk, Stock Returns and the Macroeconomy", introducing a new tail risk measure based on the risk-neutral excess expected shortfall of a cross-section of stock returns. In this paper, Dr Garcia and his co-authors propose a novel way to risk neutralise the returns without relying on option price information.

During the conference, EDHEC PhD in finance affiliate faculty members who regularly deliver doctoral research seminars for the PhD programme participants also showcased their current research; Professor **Francis X. Diebold**, University of Pennsylvania: "Estimating Global Bank Network Connectedness", Professor **Harrison Hong**, Princeton University: "Robust Measures of Earnings Surprises" and Professor **Federico Bandi**, Johns Hopkins Carey Business School: "Possibly Nonstationary Cross-Validation".

The BOK conference

The Bank of Korea Conference, the 12th of its kind, titled "Employment and Growth: Roles of Macroeconomic Policy and Structural Reform" was held in Seoul late May 2016 and involved dozens of leading economists from around the world, including 2011 Nobel economics prize laureate Thomas Sargent.

Professor **Giuseppe Bertola**, presented in the Macroeconomic Policies, Employment and Growth session and participated in the concluding panel.

Swiss Finance Institute Seminar

Professor **Riccardo Rebonato** delivered a seminar entitled "Coherent Stress Testing – Should We Worry? What Should We Do?" on 1 June 2016 in Zurich opened to senior practitioners in finance and banking, covering the following points: What is required of a useful stress testing programme, how to combine

logical consistency and powerful intuition: Bayesian Nets, the joys of causal explanation and the poverty of association, how to assess the sensitivity of the stress-testing results to the inputs, and stress testing for trade analysis and for portfolio management.

Forthcoming presentations

Professor **Lionel Martellini** will be a speaker at the JOIM-Oxford-EDHEC Retirement Investing Conference 2016, on 11-13 September in Oxford.

EDHEC PhD in Finance Programme core faculty member Professor **Raman Uppal** will present the results of his recent research work on "Asset Allocation and Asset Pricing with Opaque and Illiquid Assets" in Paris on 22 September 2016 during a workshop titled "Trading and investing in opaque markets", organised by EDHEC-Risk Institute with the support of the French Banking Federation.

Dr Uppal has been invited to discuss his current research at the 9th INQUIRE (The Institute for Quantitative Investment Research) Business School Seminar will be kindly hosted by Cass Business School in London on 28 November 2016.

Professor **Giuseppe Bertola** will be a speaker for the International Monetary Fund's 2016 Jacques Polak Research Conference in honour of Olivier Blanchard, on 3-4 November in Washington DC ("Labour Markets and Employment in EMU")

Recent and forthcoming articles by faculty

Below is a selection of articles by programme faculty members which were published in 2015/2016 or are forthcoming. These include articles in scientific journals co-authored by faculty members publishing under their EDHEC Business School or EDHEC-Risk Institute affiliations.

- Labor policies and capital mobility in theory and in EMU. Giuseppe Bertola, *European Economic Review*, 87 (2016) 62–77.

- A New Approach to Statistical Arbitrage: Strategies Based on Dynamic Factor Models of Prices and their Performance. Sergio M. Focardi, **Frank J. Fabozzi**, and Ivan Mitov. *Journal of Banking and Finance*, Vol. 65 (April 2016), pp. 134-155.

- Hedge Fund Allocation: Evaluating Parametric and Nonparametric Forecasts Using Alternative Portfolio Construction Techniques. Mohan Subbiah* and F**rank J. Fabozzi**. *International Review of Financial Analysis*, Vol. 45 (May 2016), pp. 189-201.

- Pricing Coupon Bond Options and Swaptions under the One-Factor Hull-White Model. Vincenzo Russo and **Frank J. Fabozzi**. *Journal of Fixed Income*, Vol. 25, No. 4 (Spring 2016), pp. 76-82.

- Equity Style Allocation: A Nonparametric Approach. Mohan Subbiah* and **Frank J. Fabozzi**. *Journal of Asset Management*, Vol. 17, No. 3 (May 2016), pp. 141-164.

- The Long and the Short of the Risk-Return Trade-Off. Marco Bonomo, **René Garcia**, Nour Meddahi, and Romeo Tédongap. *Journal of Econometrics*, Volume 187, Issue 2 (2015), pp.580-592.

- Recent Advances in Old Fixed-Income Topics: Liquidity, Learning and the Lower Bound. **René Garcia** and Jean-Sébastien Fontaine. Forthcoming in *Handbook of Fixed Income Securities*, First Edition, 2016 edited by Pietro Veronesi, John Wiley Sons, Inc.

- Economic Implications of Nonlinear Pricing Kernels. **René Garcia** and Caio Almeida. *Management Science*, 2016, forthcoming.

- Understanding Dynamic Mean Variance Asset Allocation. **Abraham Lioui** and Patrice Poncet. *European Journal of Operational Research*, 2016, forthcoming.

- Mass Customisation versus Mass Production – How an Industrial Revolution is about to Take Place in Money Management and Why it Involves a Shift from Investment Products to Investment Solutions. **Lionel Martellini**. *Journal of Investment Management*, 2016, forthcoming

- Equity Portfolios with Improved Liability-Hedging Benefits. Guillaume Coqueret, **Lionel Martellini** and Vincent Milhau. *Journal of Portfolio Management*, 2016, forthcoming.

- The Intended and Unintended Consequences of Financial-Market Regulations: A General Equilibrium Analysis. Adrian Buss, Bernard Dumas, **Raman Uppal**, and Grigory Vilkov. Forthcoming in *Journal of Monetary Economics* 81, July issue.

* **Mohan Subbiah** is a graduate of the EDHEC PhD in Finance programme.

Alumni news in brief

The paper "Valor-Coppead Indices, Equally Weighed and Minimum Variance Portfolios", authored by **Carlos-Heitor Campani**, PhD (2013), Professor of Finance at COPPEAD Graduate School of Business of the Federal University of Rio de Janeiro, was published in the *Brazilian Review of Finance*, Vol. 14, No. 1, 45 – 64, 2016.

Rama Malladi, PhD (2016), Partner & Head of Analytics at Kubera and Finance Faculty member at California State University has a paper co-authored with Frank J. Fabozzi, "Skillful Hiding: Evaluating hedge fund managers' performance based on what they hide" forthcoming in *Applied Economics* (July 2016).

Gideon Ozik, PhD (2011), founder and managing partner at MKT Mediastats, a technology and research firm specialised in deriving unique perspectives on assets from big data, has just started a collaboration with State Street and AXA Investment Managers (AXA IM) to evaluate data-driven indicators that help analyse economic and market information.

Last Spring, Michelle Sisto, PhD (2014), Professor of Statistics at EDHEC Business School and since a year Director of the EDHEC Global MBA programme, organised a cocktail party at the Raffles Hotel in Singapore gathering Global MBA students, EDHEC Alumni including PhD in Finance graduates and PhD in Finance participants based in Singapore.

Michelle Sisto, PhD (2014) with Ian Phang (PhD candidate), Yifan Yang, PhD (2014), Cheryl Lim (PhD candidate) and Chris Firth, PhD (2015).

Michelle Sisto with Kelvin Foo, PhD (2012) and Ian Phang.

EDHEC Business School news

EDHEC's MSc in Finance is back in the world top 5 alongside MIT and HEC (Financial Times)

EDHEC Business School's MSc in Finance was ranked 4th worldwide in the 2016 Financial Times ranking of Masters in Finance. This result once again confirms the excellence and international standing of EDHEC's training programmes amid an increasingly competitive backdrop. Following the *EFinancialCareers* ranking, which placed EDHEC 1st among French business schools with recruiters in the City of London, the Financial Times now rates EDHEC's MSc in Financial Markets 4th worldwide (ahead of the equivalent programmes offered by MIT and Oxford) and in the top 3 in France (along with HEC and ESCP). It should be noted that in terms of individual criteria, EDHEC's programme was ranked 2nd for international mobility and 4th for international experience, and also recorded significant progress in terms of average salaries compared to 2015.

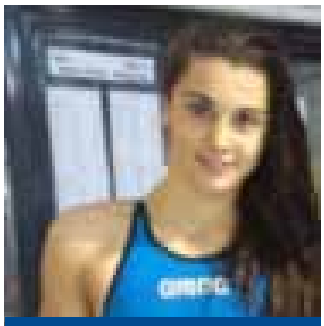
This new international classification cements EDHEC Business School's position in the leading trio of business schools in France: *U-Multirank* (April 2016) rated EDHEC as the leading French business school and the Financial Times also ranked the EDHEC Global MBA in the top 3 in France for the first time, along with HEC and INSEAD (January 2016), as did *The Economist*.

"*This result confirms the relevance of our 'for business' model which ensures our training programmes directly impact companies and business in general. This model helps us stand out from our rivals and positions us among the global elite of business schools, with a focus on serving our students*", explains Olivier Oger, Dean of EDHEC Business School.

Great performance for the athletes of the EDHEC BBA

EDHEC is proud to announce the sports performance of its students; amongst them, Philippe Pape-Amagou (basketball) and his team won the French Basketball Championship, Chloé Hache, Olympic Nice Natation (Swimming) has just been selected for the European Championships in London and for the Olympic Games in Rio de Janeiro, and the South African François Van der Merwe (Racing 92 Rugby) and his club won the French Rugby Championship and were also finalists in the European Rugby Champions Cup. Also selected for the 2016 Olympic Games were Lara Grangeon (Swimming) and Reina-Flor Okori (100 meters hurdles), who will represent her native Equatorial Guinea at this year's Olympics.

Philippe Pape-Amagou


Chloé Hache


François Van der Merwe

Combining sport and study, these students are part of the 50 top-flight athletes (more than 15 different disciplines) who have already joined the unique on-line Bachelor programme specifically tailored to their needs while pursuing their passion. This course of study is compatible with the rhythms, constraints and competition schedules of athletes. The school provides a legitimate response to a two-fold plan: reconciling competitive sports and the pursuit of higher education.

This year, the EDHEC on-line BBA programme will extend his selection to artistic talents (musicians, ballet dancers), students with a long-term health condition and young entrepreneurs.

EDHEC-Risk Institute news

Upcoming event

JOIM-Oxford-EDHEC Retirement Investing Conference

11-13 September 2016
Oxford, United Kingdom

EDHEC-RISK

JOIM

The **JOIM-Oxford-EDHEC Retirement Investing Conference** will take place on 11, 12 and 13 September 2016 on the Oxford University Campus and showcases the highest quality thinking and research in the area.

For the first time, EDHEC-Risk Institute, The Journal of Investment Management (JOIM) and Oxford University have joined forces to feature the most relevant academic insights with an immediate as well as a future impact on the practice of Retirement Investing.

The keynote speech will be delivered by the **Nobel Prize recipient Robert Merton, MIT Sloan School of Management**. The conference will open with a round table session on New Developments in Retirement Investing moderated by **Liam Kennedy, Editor of Investment & Pensions Europe** and involving the participation of several distinguished industry speakers, including Mark Fawcett (CIO, NEST Corporation) and Joanne Segars (Chief Executive, Pensions and Lifetime Savings Association), as well as selected asset managers.

The event will then continue with seven, well-focused academic presentations from prestigious speakers including **Deborah Lucas** from the **MIT Sloan School of Management**, **Magnus Dahlquist** (Stockholm School of Economics), **Elroy Dimson** (London Business School), **Tim Jenkinson** (University of Oxford), **Martin Leibowitz** (Morgan Stanley Research), **Mark Kritzman** (Windham Capital), and **Lionel Martellini**, EDHEC-Risk Institute.

More information and full programme are available **here**.

A selection of recent EDHEC-Risk Institute Publications

• **Factor Investing and Risk Allocation: From Traditional to Alternative Risk Premia Harvesting,**
Jean-Michel Maeso, Lionel Martellini

This study extends the analysis of factor investing beyond traditional factors and seeks to investigate what the best possible approach is for harvesting alternative long short-risk premia. There is a growing interest amongst sophisticated institutional investors in factor investing. It is now well accepted that the average long-term performance of active mutual fund managers can, to a large extent, be replicated through a static exposure to traditional factors, which implies that traditional long-only risk premia can be most efficiently harvested in a passive manner. While the replication of hedge fund factor exposure appears to be a very attractive concept, we find that hedge fund replication strategies achieve in general a relatively low out-of-sample explanatory power, regardless of the set of factors and the methodologies used. Our results also suggest that risk parity strategies applied to alternative risk factors could be a better alternative than hedge fund replication for harvesting alternative risk premia in an efficient way. A key challenge for the alternative investment industry remains the capacity to develop investable efficient low-cost proxies for harvesting alternative risk premia not only in equity markets but also in the fixed income, currencies and commodity markets.
More...

• **A Primer on the Tax Framework of Offshore and Onshore Hedge Funds,**
Michel Brocard, François-Serge Lhabitant

The goal of this paper is to provide an introduction to the typical legal structures used by hedge funds and their major tax implications for the fund, for fund managers, for sponsors and for various investor types. Most of our discussion is centred on U.S. federal income taxes; we will occasionally discuss state or local taxes. Obviously, other countries have different tax laws that may provide different or specific tax outcomes, and it is beyond the scope of our paper to review them. We will first examine the situation of hedge funds based in the U.S. ("onshore funds") and then follow up with the case of hedge funds based outside of the U.S. ("offshore funds"). In the latter case, we will focus specifically on the Cayman Islands as an illustration, since this is the largest offshore centre for hedge funds. Ultimately, we will discuss the case of hybrid hedge funds, as well as some recent international tax and regulatory developments such as BEPS and FATCA and their impact on hedge funds.
More...

• **Frictional Diversification Costs: Evidence from a Panel of Fund of Hedge Fund Holdings,**
Juha Joenväärä, Bernd Scherer

Using FoFs' holdings data, the authors analyse the diversification choices of fund of hedge fund managers. Diversification is not a free lunch. It is not available for every fund of fund. Instead they find a positive log-linear relation between the number of constituent funds in a fund of hedge fund (n) and the respective assets under management (AUM).

More precisely it takes the form: $n^2 \propto AuM$. This relation is consistent with the predictions from a model of naive diversification (1/n) with frictional diversification costs such as due diligence costs. Their evidence is econometrically robust across alternative specifications and explanations.
More...

• **Portfolio Choice with Model Misspecification: A Foundation for Alpha and Beta Portfolios,**
Raman Uppal, Paolo Zaffaroni

In this paper, our objective is to provide a rigorous foundation for alpha and beta portfolio strategies. In particular, we characterise the properties of these strategies when there is model misspecification in either the alpha component or the beta component of returns and show how to mitigate the effect of model misspecification for portfolio choice. The APT is ideal for this analysis because it allows for alphas, while still imposing no arbitrage. Our first contribution is to extend the interpretation of the APT to show that it can capture not just small pricing errors that are independent of factors, but also large pricing errors arising from mismeasured or missing factors. Our second contribution is to show that under the APT, the optimal mean-variance portfolio in the presence of a risk-free asset can be decomposed into two components: an 'alpha' portfolio that depends only on pricing errors and a 'beta' portfolio that depends only on factor risk premia and their loadings.
More...

Important information for prospective applicants

Application Information
Executive and Residential track
The next application deadline is 15 December 2016 for September 2017 admission (executive and residential tracks).

Next programme presentations
Presentations are scheduled all year round in Asia, Australasia, Europe, North America and online.

Sessions are upcoming in Singapore (23-25 August) and London (26-27 September)

For more information about the programme, to register for a presentation or to request an application form, please contact **Brigitte Bogaerts**.

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