Actuarial Science and Quantitative Finance Fourth-year Projects

(BUS4029H/BUS4129H and BUS4053H/BUS4153H) Topics list 2018

Likely date of presentation: 07/ 03/2018

Contents

Introduction

This document lists the topics proposed by all the lecturers in Actuarial Science at UCT, plus many others who have very kindly offered to supervise projects. See the end of this document for detailed instructions on how you express your preferences; but note that it is possible to create a topic of your own, supervised by someone not on this list. In that case, however, you will have to approach the supervisor and establish that he/she is willing to take on this responsibility, and we will have to make sure that the supervision arrangements are satisfactory. In this case, you should therefore give your proposed topic as your first choice but still follow the instructions in other respects.Below each topic heading there is an availability indicator: **A** indicates a topic available to Actuarial Science students and **Q** a topic available to Quantitative Finance students, with **AQ** obviously indicating availability to all students, and a number which indicates the maximum number of students which can be accommodated on the topic.

We will endeavour, as far as is possible, to allocate students their first choice, subject to a reasonable distribution across supervisors. This may, however, not be possible in all cases. Note, for instance, that there are supervisors who have listed a choice of topics but who are limited in the number of students that they can supervise in total.

Please choose from topics from these . Your five project topics for 2018 must be topics supervised by five different supervisors.

Should you wish to select topics from any of the external supervisors' choices, you may wish to make contact with these supervisors to discuss their topics before you hand in your topic choices.

Forms are supplied (at the end of this document) for you to indicate your choices, and to provide us with contact information.

Ideally you should contact the supervisors of projects you are unsure about to help you make up your mind, but should you wish to select a topic from those suggested by supervisors outside UCT Actuarial Science, you must make contact with the supervisor to discuss the topic before you hand in your topic choices.

Sure Mataramvura (course convenor)

CB1: Understanding the impact of lecture recordings on student learning

Supervisor	Claire Blackman
Organisation	Department of Mathematics & Applied Mathematics, UCT
Contact details	claire.blackman@uct.ac.za
Project Topic/ Title	Understanding the impact of lecture recordings on student learning (Education)
Code	AQ
Max students	2
Description	The UCT Classroom Renewal Project has equipped many UCT lecture venues with lecture recording equipment. While many lecturers are now recording their lectures and making them available to students via Vula, it is not yet clear what, if any, impact recording availability has on student learning at UCT. This project will focus on answering the following questions: - When do students use lecture recording? - How do students use lecture recordings? - What effect does availability of recorded lectures have on student attainment?
Skills required	Excel, an ability to search and review literature.
Data sources	The 2016 and 2017 Vula data for lecture recordings watched by MAM1010F students will be available for analysis. The course evaluations are also available, which have (anonymised) responses around the use of lecture videos. There is also the possibility of follow up interviews with students.
Recommended reading	"Student Use of Recorded Lecturers", Karnard, A., LSE (http://eprints.lse.ac.uk/50929/1/Karnad_Student_use_recorded_2013_author.pdf) "Lecture Capture Literature Review", Gabi Witthaus and Carol Robinson, (tinyurl.com/lecture-capture-lboro)

CM1: Estimating the impact of the Road Accident Fund Amendment Act (2005) on the financial position of the Road Accident Fund

Supervisor	Coetzee Marais
Organisation	UCT
Contact details	coetzee.marais@uct.ac.za
Project Topic Title	Estimating the impact of the Road Accident Fund Amendment Act (2005) on the financial position of the Road Accident Fund.
Code	AQ
Max students	3
Description	The Road Accident Fund (RAF) is a state fund that was set up by the RAF Act of 1996 to provide compulsory cover to all users of South African roads against injuries sustained or deaths arising from accidents involving motor vehicles within the borders of South Africa. This cover is in the form of indemnity insurance to persons who cause the accident, as well as personal injury and life insurance to victims of motor vehicle accidents and their families. Owing to the RAF poor financial position, the Road Accident Fund Amendment Act (2005) was implemented in 2008 in an attempt to curb the flow of funds from the Fund. This project entails estimating the impact of the Amendment Act and requires a projection of the RAF's outstanding claims liability based on basic chain ladder run-off triangles for homogeneous groups of claims data.
Skills required	This project will require students to analyse a data set from the RAF, set up a chain ladder valuation model and produce estimates of the RAF's outstanding claims liability based on different assumptions and run-off triangle methods. Basic data manipulation (in R, SAS or similar) is needed, as well as a firm grasp of run-off triangles as per ASSA subject A204.
Data sources	A data set on RAF claims will be made available.
Recommended reading	RAF Annual Report 2017 (available at http://www.raf.co.za) Boland, P. J. (2007). Claims Reserving and Pricing with Run-Off Triangles.

	Statistical and Probabilistic Methods in Actuarial Science. Boca Raton: Chapman & Hall. England, P. D. and Verrall, R. J. (2006) Predictive distributions of outstanding claims in general insurance. Annals of *Actuarial Science*, 1 (2). RAF Commission 2002. Funding Road Accident Compensation. *Report of the Road Accident Fund Commission.* Satchwell, K.M.

CM2: A comparison of approaches to solvency requirements for microinsurance business across Africa

Supervisor	Coetzee Marais
Organisation	UCT
Contact details	coetzee.marais@uct.ac.za
Project Topic Title	A comparison of approaches to solvency requirements for microinsurance business across Africa
Code	AQ
Max students	2
Description	Microinsurance refers to insurance that is accessed by the low-income population, provided by a range of market participants, and managed in accordance with generally accepted insurance practice. Several African insurance regulators have responded to the uptake of microinsurance in Africa through the issuing of new legislation governing the conduct of microinsurers in the respective markets. This notably includes the Financial Services Board, who issued draft rules on prudential requirements for microinsurance business for South Africa in 2016. This topic requires a comparison of the prudential and solvency requirements for microinsurance business across insurance markets in Africa. An insight into the financial implications of the different approaches will also be required.
Skills required	This project will require students to evaluate the practical implications of legislation on the operating model of insurers.
Data sources	The latest microinsurance legislation for South Africa, Ghana, Tanzania and Uganda is publicly available and should serve as a good starting point for the comparison.
Recommended reading	Bhoola, K., Madzhadzhi, T. Narayan, J. Strydom, S. and Van Heerden, H.H. (2014) *Insurance Regulation in Africa: Impact on Insurance/Growth Strategies*. [Presented at the Actuarial Society of South Africa Convention 2014]. Churchill, C. (2006). *Protecting the Poor A Microinsurance Compendium*. Geneva: International Labour Organization International Association of Insurance Supervisors. (2015). *Insurance Core Principles*.

	Additional reading: Afande, F.O. and Maina, M.P. (2015). Capital Requirements for Kenyan Life Insurance Companies. *International Journal of African and Asian Studies*, **8**, 26-50. International Monetary Fund (2013). *Nigeria: Publication of Financial Sector Assessment Program Documentation – Detailed Assessment of Observance of Insurance Core Principles*. Washington, D.C: IMF

DK1: The opportunities and risks of hyper selection of life insurance risks.

Supervisor	David Kirk
Organisation	Milliman
Contact details	David.kirk@milliman.com 021 001 2921
Project Topic/ Title	The opportunities and risks of hyper selection of life insurance risks.
Code	A
Max students	3
Description	The traditional insurance approach of pooling risks into large fairly homogenous groups is being challenged by technology and greater data availability. These homogenous groups can be made smaller and smaller with increased accuracy in risk assessment, ultimately potentially down to "pools" containing just a single individual. Scraping of social media pages, search history, links to wellness and loyalty progammes, other financial services products owned, transactional data and activity levels can already be used to assess the risk of disability or death of an individual. At the same time, there is research suggesting that some amount of anti-selection could be optimal for society and perhaps "hyper selection" of risks is not ideal from a socioeconomic policy perspective. The project could cover the opportunities and risks to insurers in selecting risks ever more precisely, including the profit and risk and capital implications of doing so. Potential impacts on policyholders could also be covered, along with normative questions such as "should this be allowed" and is insurance still insurance without pooling?
Skills required	Structured thinking and the ability to synthesize information without being lost. An ability to search and review literature (academic and current industry publications). Some numerical analysis could be useful.
Data sources	Data is not available nor expected to be necessary for this project.

Recommended reading	Academic sources may be limited. North American CRO Council, Risk Implications of Data and Analytics to the Insurance Industry, http://www.crocouncil.org/images/CROC_Risk_Implications_of_Data_and_Analytics_to_the_Insurance_Industry_20170106.pdf Institute of Actuaries of Australia 2016, The Impact of Big Data on the Future of Insurance, https://actuaries.asn.au/Library/Opinion/2016/BIGDATAGPWEB.pdf https://www.munichre.com/site/mruk-allfinanz/get/documents_E389288463/mruk/assets.uk.allfinanz/Documents/Publications/Thought-Leadership/Antiselection.pdf https://www.ft.com/content/bb9f1ce8-f84b-11e6-bd4e-68d53499ed71 Hao, MacDonald, Tapadar, and Thomas. Insurance Loss Coverage and Demand Elasticities, Insurance: Mathematics & Economics, 2018 Thomas, G, (2017). Loss Coverage, Cambridge University Press

DK2: Systemic Risk in Insurance. Analysis of industry specific risk for insurers after CAPM style systemic risk has been accounted for.

Supervisor	David Kirk
Organisation	Milliman
Contact details	David.kirk@milliman.com 021 001 2921
Project Topic/ Title	Systemic Risk in Insurance. Analysis of industry specific risk for insurers after CAPM style systemic risk has been accounted for.
Code	A or QF
Max students	3
Description	Systemic risk has been a major topic in financial sector risk management and regulation since the Global Financial Crisis. Industry and regulators often taken quite different views on the extent of systemic within insurance (as opposed to banking where it is well established.) This project is a limited investigation into the relationship of share prices of insurers, after removing CAPM style systemic risk. The relationships of specific risk between insurers, over time, between insurers and banks, estimation of Betas for insurers and the interaction between insurer balance sheets and volatility, systemic risk and specific risk could all be considered. (It would not be expected to all of this analysis and an interest first part of the project would be to consider which analyses to perform.) Systemic risk and Beta estimation also have applied uses in discount rate setting for valuating insurance companies and other businesses. This could be another area of analysis for the report. Given the limited number of listed insurers in South Africa, it is recommended to consider South Africa and at least one other country in the analysis.
Skills required	Standard statistical and regression skills (multiple linear regression or other techniques) would be helpful. Basic financial statement analysis may be helpful.
Data sources	Historical share price information will be necessary. This is fairly standard data and should be readily available through the university library.
Recommended reading	Modelling Systemic Risk in the South African Banking Sector Using CoVar, Modelling Systemic Risk in the South African Banking Sector Using CoVar, September 2017,

	https://econrsa.org/system/files/publications/working_papers/working_paper_709.pdf http://systemicrisk.org.za/ and https://www.fin24.com/Companies/Financial-Services/were-sound-sa-banks-react-to-risk-ranking-20170319 Measuring the systemic risk in the South African banking sector, Gregory M. Foggitt, Andre Heymans, Gary W. van Vuuren, Anmar Pretorius, https://sajems.org/index.php/sajems/article/view/1619 Estimating the Cost of Equity Capital for Insurance Firms with Multi-period Asset Pricing Models, Alexander Barinova Steven W. Pottier b Jianren Xu*, 2014, http://faculty.ucr.edu/~abarinov/JRI%20February%202016.pdf

DK3: Understanding the hypothetical impact of different levels of non-independence in individual retrenchment risks for credit life for pricing, risk management and economic capital

Supervisor	David Kirk
Organisation	Milliman
Contact details	David.kirk@milliman.com 021 001 2921
Project Topic/ Title	Understanding the hypothetical impact of different levels of non-independence in individual retrenchment risks for credit life for pricing, risk management and economic capital
Code	A
Max students	3
Description	Retrenchment risk is the largest risk for credit life providers who insurer lenders against death, disability or loss of income of the borrower. Unlike mortality where except in fairly extreme scenarios, risks are mostly independent, retrenchment risks are not independent. Factors such as industry, employer, skill level, geographic location and others will add dependence into the risks. The Solvency Assessment and Management standard formula "shock" for retrenchment is an oddly low "50% increase" Detailed data of these factors and experience are not widely available to calibrate distributions. This project will consider the available literature and insurer experience to understand likely causes of dependence. A simple model will be constructed to show the move in risk from full independence to full dependence with plausible but un-validated assumptions
Skills required	Statistical modelling, Excel or R or similar. Simulation.

	Compound processes, negative binomial distributions, mixed distributions may come up – more of an opportunity to cement your understanding that requiring full understanding to start the project. The ability to take a non-traditional problem with few hard assumptions and rules and turn it into something useful and interesting as a first step in an under researched area. Copulas could be used, but given the limitation on data would probably be spurious. Plenty of simplifications are available and will be required – the model doesn't need to be extremely complex.
Data sources	No hard data will be available. The supervisor will be able to guide in general terms of what factors are considered in industry and reasonable levels of mean experience and variability from prior research with other students.
Recommended reading	FSB Financial Soundness for Insurers and related guidance https://www.fsb.co.za/Departments/insurance/Documents/Position%20Paper%20108%20(v%204)%20FINAL.pdf https://www.casact.org/pubs/forum/02wforum/02wf057.pdf https://www.iol.co.za/business-report/retrenchment-insurance-whats-on-offer-2094449 https://www.ricam.oeaw.ac.at/specsem/sef/events/program/slides/Albrecher_Tutorial.pdf

EF1: Returns-Based Style Analysis and it's Enhancements

Supervisor	Emlyn Flint
Organisation	Peregrine Securities
Contact details	emlynf@peregrine.co.za
Project Topic/ Title	Returns-Based Style Analysis and it's Enhancements
Code	AQ
Max students	1 (limited to single students)
Description	Sharpe (1992) introduced the concept of returns-based style analysis (RBSA), which in essence is a form of regression of a fund's return onto a set of factors subject to the constraint that the betas sum to 1. These betas thus represent the factor style mix of the fund and also provide one with a set of long-only weights that could be used to create a replicating portfolio of the fund, assuming that the chosen factors are actually investable. RBSA in its original form is still commonly used today by both portfolio managers and risk managers. However, there are several shortcomings of the original method largely due to the use of ordinary least squares regression which assumes static style weights over time. In this project, the student will do some or all of the following: 1. Review the original RBSA and show that it fails to yield correct results even in the simple case of a buy-and-hold strategy of market indices. 2. Consider enhancing the original model by means of a Kalman filter or Particle filter as per Corielli & Meucci (2004) 3. Consider the effect of running RBSA separately on individual assets and aggregating to the portfolio level to calculate better point-in-time style weights 4. Consider the time-varying factor model as per Ang et al. (2017) which uses cross-sectional risk characteristics rather than time series returns.
Skills required	Good computer programming skills (Matlab, Python or R) are a definite plus.

Data sources	Fund data is easily available from INet and Bloomberg. Peregrine can provide Factor data. Otherwise, fund and factor data will be simulated.
Recommended reading	1) Sharpe (1992) Asset allocation: Management style and performance measurement 2) Corrieli & Meucci (2004), Pitfalls in linear models for style analysis 3) Ang, Madhavan & Sobczyk (2017), Estimating Time-Varying Factor Exposures 4) Swinkels & van der Sluis (2006), Return-based Style Analysis with Time-varying Exposures 5) Fukui, Sato & Takahashi (2017) Style Analysis with Particle Filtering and Generalized Simulated Annealing.

EF2: Analysis of Break-Even Volatility Methods

Supervisor	Emlyn Flint
Organisation	Peregrine Securities
Contact details	emlynf@peregrine.co.za
Project Topic/ Title	Analysis of Break-Even Volatility Methods
Code	AQ
Max students	1 (limited to single students)
Description	Options 101: The Black-Scholes-Merton (BSM) model is the standard framework for pricing options. According to this framework, the value of a European option with a given strike and term depends only on a single input model parameter: namely, the asset's volatility. Turning this process around, if we see a price for an option in the market, then we can use the BSM model to calculate the volatility level that is *implied* by this given option price. And one can do this for all quoted options in the market in order to create a set of *implied volatilities* across all available strikes and terms. If graphed, this set of implied volatilities creates a surface across strike and term dimensions. This implied volatility surface is what option traders and risk managers use to price new derivatives and manage existing positions. However, this process only works when there are a sufficient number of traded options for the asset in question. Consider an investor who wants to trade an option on an asset which has no existing options. In this case, how do we define what the fair value of an option should be? This is the question that Break-Even volatility (BEV) attempts to answer. Specifically, the BSM framework shows that one can replicate the payoff of an option by following a dynamic trading strategy in the underlying asset and cash – this is referred to as dynamic delta hedging. The BEV method says that the *fair value* of an option should be such that if one were to hold that option and simultaneously follow the replicating trading strategy, then one should have zero profit or loss. Thus, BEV can be used to calculate fair values for assets with no traded derivatives or as a rich/cheap indicator for assets with traded derivatives. In this project, the student will familiarise themselves with the BEV methodology and test under simulation the accuracy of a number of variants of this method

Skills required	Good computer programming skills (Matlab, Python or R) are a requirement for this one.
Data sources	All data will be simulated, or sourced by Peregrine.
Recommended reading	1) Dupire (2005), Fair Skew: Break-Even Volatility Surface 2) Suzuki & Vyas (2011), Break-even Volatility 3) Flint, Ochse & Polakow (2014), Estimating Time-Varying Factor Exposures → see Sections 1 for general info and 7 specifically for BEV 4) Gray & Newman (2005), Canonical Valuation of Options in the Presence of Stochastic Volatility 5) Hayley & Walker (2010), Alternative Tilts for Nonparametric Option Pricing → Ultimately, you will copy the last two study's methodology but using BEV instead of their canonical valuation method.

EF3: Generating constrained random correlation matrices efficiently

Supervisor	Emlyn Flint
Organisation	Peregrine Securities
Contact details	emlynf@peregrine.co.za
Project Topic/ Title	Generating constrained random correlation matrices efficiently
Code	AQ
Max students	1 (limited to single students)
Description	The correlation matrix plays a critical role in many applications in risk management and portfolio management. When simulating a given market, one generally needs to input a correlation matrix, which controls the relationship between the simulated variables. This correlation matrix needs to symmetric and positive semi-definite. While it is fairly trivial to generate such a matrix for low dimension problems, doing the same in high dimension is challenging. Furthermore, one may also want to constrain certain aspects of the correlation matrix to match with reality, e.g. fixing minimum, average and maximum correlation values across the matrix. This project tackles the generation of constrained random correlation matrices. The student will provide a comprehensive theoretical review of existing generation methods as well as a practical review in terms of method efficiency and flexibility (i.e. how much control does the user have over the matrix). There is also scope for introducing a novel construction method.
Skills required	This project is aimed towards students with pre-existing coding skills. Good linear algebra skills are also a plus.
Data sources	Almost all data will be simulated. Any required real-world data can be easily obtained from Bloomberg, INet or Datastream.
Recommended reading	1) Numpacharoen, K., & Atsawarungruangkit, A. (2012). Generating correlation matrices based on the boundaries of their coefficients. *PloS one*. 2) Lewandowski, D., Kurowicka, D., & Joe, H. (2009). Generating random correlation matrices based on vines and extended onion method. *Journal of multivariate analysis*. 3) Read these three online discussions on this topic: one, two, and three

EM1: The optimal allocation to Africa for the Institutional Investor

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	The optimal allocation to Africa for the Institutional Investor
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	Introduction Strategic asset allocation is of primary importance to the institutional investor (e.g. pension funds, sovereign wealth funds and family offices). Over time, typical allocations have grown beyond the traditional building blocks of developed market public equity, bonds, property and cash to also include hedge funds, private equity, infrastructure and other niche investment classes as well as investments into less developed markets, including Africa. The recent South African government budget for the 2018/19 fiscal year increased maximum allocation which pension funds can make to African investments from 5% to 10%. International investors do not have explicit regulations on African allocations, but where there is such an allocation it is marginal and usually through broader diversified emerging market allocations. With a population of 1.3bn, of which 36% live on less than $1 per day, the African continent has large untapped economic and investment potential. Basic resources abound. Yet, political instability, corruption and insufficient infrastructure impedes growth. While Africa is expected to have 11 of the top 20 fastest growing economies over the next 5 years, the World Bank's projected growth rates vary widely between African countries. This highlights the disparate investment opportunities across the continent and the need for strong local partnerships and detailed knowledge of local conditions to make informed investment decisions. Many investors that do venture into Africa (and other emerging and frontier markets) insist on making a positive impact on society. Far from being purely altruistic, it is thought that sound ESG (Economic, Social and Governance) practices are important to fight corruption, incompetence and inefficiency, ultimately enhancing growth and investment success. Furthermore, certain types of investment can have a direct catalytic impact on markets, societies

	and consumers – which does not have to come at the expense of investment returns. <u>The research question</u> (**Project Scope to be specified from the items below**) This project will research the impact of investment into Africa for the institutional investor and its portfolio. The research will require: i) Identification of African asset classes that are available to the institutional investor and development of an understanding of each asset class's characteristics ii) Consideration of how each asset class can: a. contribute to a portfolio from an investment perspective; and b. best impact the African consumer iii) Determination of the optimal allocation to Africa, and across asset classes within Africa, for a typical institutional investor (South African and international) with the dual objectives of generating strong, diversified long-term real returns and having a positive developmental impact on African societies and consumers iv) Identification of a range ofprofiles of representative investors that are determined to have the capacity – from a financial and governance perspective – to allocate to a multi-asset Africa investment portfolio, profiled according to, *inter alia*: a. geography; b. fund type; c. objectives; d. current strategic asset allocation; and e. local regulatory or other constraints v) Development of a model which optimises the allocation according to the representative investor profiles and bespoke profiles as determined by users of the model vi) Articulation of the benefits to an institutional investor (local and international) of an allocation to African markets Regular contact with senior executives from Sanlam's Africa Investments business, which is requesting this research, is available.
Skills required	An ability to search and review literature, strategic thinking, strong interest in investment.
Data sources	Bloomberg.
Recommended reading	1) Amadou N.R. Sy, Trends and Developments in African Frontier Bond Markets. Policy Paper 2015-01, Global Economy and Development.

	2) GRAHAM SMITH AND ANETA DYAKOVA, AFRICAN STOCK MARKETS: EFFICIENCY AND RELATIVE PREDICTABILITY. South African Journal of Economics Vol. 82:2 June 2014. 3) Rabah Arezki and Amadou Sy, Financing Africa's Infrastructure Deficit: From Development Banking to Long-term Investing. Journal of African Economies, 2016, Vol. 25, AERC Supplement 2, pp. ii59–ii73.

EM2: Translating floating rate credit spreads into fixed-rate credit spreads when valuing unlisted instruments

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	Translating floating rate credit spreads into fixed-rate credit spreads when valuing unlisted instruments
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	Floating rate credit bonds and credit spreads: From the perspective of a corporate issuer, listed credit is thought of as an alternative to bank funding. Often the listed credit pays a floating rate to the investor, i.e. the corporate pays JIBAR plus an entity-specific-spread. This rate is often higher than the floating rate paid by banks in the market, i.e. higher than JIBAR plus bank-spread. Fixed rate listed credit: While corporate issuers see listed credit as an alternative to bank funding, investors can wear one of two hats: they can think of the listed credit as either an alternative to a floating bank credit instrument or as an alternative to a fixed rate government bond. For those investors who like fixed rate instruments, banks often facilitate conversions from floating to fixed rate instruments at issue via the swap curve. So, these converted bonds are issued as fixed rate bonds. Consistency: For any cashflow to be paid by an entity at some future point in time, one might expect that a unique discount rate should apply. This rate could be expressed as swap rate plus floating-rate-credit-spread or government bond rate plus fixed-rate-credit-spread. Since the relationship between swap rates and government bond rates is dynamic, this implies a dynamic relationship between fixed-rate and floating-rate credit spreads. Unlisted instruments and credit matrix: Unlisted financial instruments with known future cash-flows and known credit rating can be (and often are) valued using a risk-free yield curve with an associated *credit-matrix*. Such a credit matrix expresses a risk premium (or spread) as a function of two variables: term outstanding and credit rating. The credit matrix can be constructed from listed

	instruments, and then adjusted for the lower liquidity of unlisted instruments. Market participants have come to regard both the swap and government bond curves as risk-free, depending on their benchmark and perspective. Constructing the credit spread: It is not entirely clear whether a credit matrix should be constructed based on floating-rate-credit-spreads or fixed-rate-credit-spreads. Three principles to guide the decision are 1) Use the most stable spreads, 2) Use the spread with the most data points, or 3) Decide based on the purpose of the valuation The bigger picture: Looking at the bigger picure, for a financial institution, it is of primary importance that its valuations are consistent and accurate. Ideally, a valuation process should produce consistent values (between assets and liabilities, and between different assets) and also accurately report on exposures to various risk factors. For this reason, research is required to understand whether credit risk premiums should be measured and expressed relative to floating rates, swap rates, bond rates, or perhaps some other standard. One application of this research is to value property leases based on a tenants's credit rating. Research question: What is the most appropriate curve (swap curve, bank floating rate curve and government bond curve) as reference for an enity's credit risk premium to express the discount rate on cashflows to be paid by that entity?
Skills required	Technical/mathematical skills. Understanding of government finances, banking operations and corporate finance.
Data sources	Bllomberg.
Recommended reading	Pierre Collin-Dufresn, Robert S. Goldstein, J. Spencer Martin. The Determinants of Credit Spread Changes. THE JOURNAL OF FINANCE, VOL. LVI, NO. 6, DEC. 2000.

EM3: Sustainability of Competitive Advantages (sometimes referred to in the investment industry as "Moats")

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	Sustainability of Competitive Advantages (sometimes referred to in the investment industry as "Moats")
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	**Introduction and Background** **Competitive Advantages** A competitive advantage is usually visible when a company or industry has an above-average Return on Invested Capital (or an above-average Return on Equity). It is derived from either having the ability to charge a price premium (brand, difficult to copy products, better quality products, etc) or being able to demonstrate cost efficiencies (economies of scale etc), or a variation of these types of advantages (network effects etc). It is some sort of favourable characteristic (or combination of them) that allows a company to make more profit per dollar of capital invested than other companies in the industry or in the market. **Why important?** The value of any company is the free cash flow that the company will generate, from now until eternity, discounted at an appropriate multiple. This is typically done by doing explicit forecasting for ten years into the future, then assuming a terminal/steady state multiple for cash flows after that. In valuing companies, this process (discounted cash flow or DCF) is an important input used in company valuation by practitioners (though practitioners often blend this analysis by also using other valuation methods: private market transaction multiples, relative value analysis, valuation multiple shortcuts, etc.) Discounted cash flows involve first forecasting revenue growth, margins and capital intensity, which all then link to (marginal) Return on Invested Capital, in order to then derive free cash flow forecasts. Return on Invested Capital is therefore in important assumption/input into the valuation of a company.

Creating value

A company creates value when it invests capital at a return that is higher than its cost of capital. The longer a company can invest capital at a higher return on capital, the more value it creates. So the ability to grow, and the sustainability of a higher ROIC is a crucial driver of value. When a company or industry has a higher ROIC, economic theory suggests that more capital will enter the industry, and that higher ROIC will be competed away. The job of an analyst, when valuing a company, is to judge how long the business's competitive advantages will persist (i.e. how many years can the company invest at a better than average ROIC)? So growth and ROIC are the two key drivers of value in the future. (Also, note that the opposite happens in economic theory when an industry is under pressure and earning poor returns on capital/destroying economic value. In this case, companies tend to go bankrupt and capital leaves the industry, allowing remaining companies to earn a better ROIC over time.)

Valuation

Clearly, when valuing a company, you have to make assumptions as to whether a poor ROIC will improve over time, and how fast, or whether a higher ROIC will decay over time, and how fast. This can then be compared to the current price the market is placing on the company. The job of analysts is to identify mispricing and profit from it: a high quality business trading at an above-average PE multiple can still be a bargain purchase, if the market price is implying a "fade" or "reversion to mean" of the company's high ROIC that is too pessimistic (in this case an investor would make money because the business is able to sustain and invest further capital at its high ROIC for longer than the market was expecting.) Conversely, a below-average ROIC company can also be a bargain if the market price implies that its ROIC will not improve from the current low levels (or not improve fast enough).

So in short, it's important to understand whether past ROIC generated by an industry is decaying, and whether it is decaying faster than it has in the past. In other words, are competitive advantages in various industries changing?

	ROIC persistence and decay rates When making assumptions for valuation of companies in various industries, we are often guided by historic ROIC decay rates in making our assumptions of how long a company can persist in generating above-average returns. Consumer Staples and Healthcare are two sectors that have traditionally been able to show stable and high persistence of ROIC. **<u>The research question: ROIC sustainability/persistence</u>** 1) Investigate and summarise ROIC persistence and trends across time for various sectors/industries. 2) In the new Information Technology age, where digital disruption is accelerating, are Industry ROIC's decaying faster than they have in the past? 3) Which sectors are trending down in terms of ROIC, and which are trending up over time? And is the rate of change of industry ROIC increasing?
Skills required	Understanding Corporate Finance.
Data sources	Bloomberg, some websites.
Recommended reading	- Valuation: Sixth Edition, by Tim Koller and David Wessels (Mckinsey). - "What does a PE multiple mean?" Michael Mauboussin - "Measuring the Moat", Michael Maubaussin, - "Death taxes and reversion to the Mean" by Michael Mauboussin, - http://pages.stern.nyu.edu/~adamodar/

EM4: Are risk-free real interest rates and equity risk premiums mean-reverting?

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	Are risk-free real interest rates and equity risk premiums mean-reverting?
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	**Introduction** Blue Mountain Capital's Director of Research, Michael Mauboussin, recently made the comment that there are two irrefutable truths in investing, 1) an asset is worth its future cash flows, and 2) the more certain those cash flows are the lower the required return will be. The real rate: The inflation protected securities market (government issued inflation-linked bonds) provides an investor with the lowest possible risk asset – the real value of future cash flows are known; the issuer has guaranteed that the capital values will be indexed to the inflation rate. As the real size of these cash flows don't vary with time, the only determinant of value is the rate at which the cash flows are discounted. Do these discount rates mean revert and if so what are the forces that bring the discount rate back to a static/time-invariant equilibrium? The equity risk premium: Equity cash flows are riskier and therefore the discount rate for equities must be higher: finance theory suggests a risk free rate plus an equity market risk premium. The variability of the equity risk premium is of interest. Firstly, we should establish whether the equity market risk premium adjusts to changes in determinants of economic outcomes and future cash flows. To expand on this idea: there may be times when the market is more (or less) certain about a business' ability to generate a given set of expected cash flows, since equity risk can depend on economic factors such as growth, inflation, innovation, fiscal

	policy, regulatory regimes, and so forth. Secondly, we may ask, in what way does the equity risk premium does vary, and is it mean-reverting? Thirdly, if the equity risk premium is constant or strongly mean-reverting, what economic forces are at play that either maintain a relative constant level of economic risk, or an indifference to greater/less risk among investors? **Industry request** This research was requested by an asset manager, and access to the manager is available. **Research Question:** a) Model the risk-free real rate of return in the US market i. Build a stochastic model to describe the behaviour of TIPS (US government inflation-linked bonds) rates ii. Identity and describe fundamental economic and investment factors that rationally should drive change in the risk-free real rate of return, and consider how these factors change over time iii. Conclude whether the risk-free real rate is mean-reverting b) Model the equity risk premium in the US market i. Identity and describe fundamental economic and investment factors that rationally should drive change in the equity risk premium, and consider how these factors change over time ii. Establish a forward-looking measure of the equity risk-premium iii. Build a stochastic model for the equity risk premium iv. Translate the results to the implication for Price/Earnings-ratios, i.e., are P/E ratios mean-reverting? c) If both the risk free rate and the equity risk premium vary with time, how does an investor know what returns to expect from an asset over relatively short periods of time?
Skills required	Understanding economic factors driving company performance, building stochastic models.
Data sources	Bloomberg.
Recommended reading	1) Kon S. Lai, Structural change and long-run reversion in the *ex ante* real interest rate. Applied Economics Letters, Volume 22, 2015 - Issue 16. 2) Alexander Michaelides and Yuxin Zhang. Stock Market Mean Reversion and Portfolio Choice over the Life Cycle, Volume 52, Issue 3 June 2017 , pp. 1183-1209.

EM5: Investigating the efficacy of a factor rotation model in South Africa

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	Investigating the efficacy of a factor rotation model in South Africa
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	Factors are measurable characteristics of listed stocks that may in some way explain future performance. The most well understood factor is likely the price to earnings (P/E) ratio. Many studies have shown that stocks that have low PEs tend to outperform stocks with high PEs over the long term. This is often referred to as 'value investing' in the active space. We however refer to this characteristic as a 'factor' and test to see how P/E and a wide range of other factors have any predictive power. Factors are however inherently cyclical, as each factor is driven by different phenomena, they tend to outperform at different times. Our view (I would love to be proven incorrectly) has always been that dynamically or tactically adjusting your factor allocations to take advantage of cyclical performance is an enormous challenge, and something that few models can consistently take advantage of. In which case, our multi-factor portfolio have always employed static allocations through time and are rebalanced periodically. We do not discourage clients from employing factor timing however – at the margin – based on either valuations or economic cycles, however employing this approach would require a specific skill set and expertise. Rushing in and out of a factor strategy can cause harm to long-term returns and erode a portfolio's diversification. That said, factors do demonstrate some cyclicality, which offers opportunity to improve the prospects of a diversified factor portfolio. Some research indicates that it's possible to tilt to various factors to add incremental return to a multifactor portfolio by over- and underweighting select factors relative to others, while maintaining long-term exposure to all factors. From a macroeconomic perspective, conditions to determine if the factor could be helped or hindered by the current environment. For example, during the expansion phase of the business cycle, when growth is accelerating, the momentum factor has tended to perform well. One could also review the valuations of the factor to assess whether it is expensive or cheap relative to its

	own history, or to other factors. Relative strength measures also can inform a signal as to whether the factor has had strong recent performance. Another potential signal, dispersion measures, illustrate how much opportunity a factor has to outperform in the current environment—or how similarly or dissimilarly the universe of stocks demonstrates factor characteristics. More dispersion creates more opportunities. We have never undertaken a rigorous study using quality data to assess the feasibility of using factor signals to time or rotate within a portfolio. Many of our clients and index providers are offering factor-timing indices, and we would love to have a full analysis of the topic from a South African perspective.
Skills required	Data analytical skills.
Data sources	Bloomberg.
Recommended reading	1) KEITH L. MILLER, HONG LI, TIFFANY G. ZHOU, AND DANIEL GIAMOURIDIS. A Risk-Oriented Model for Factor Timing Decisions. THE JOURNAL OF PORTFOLIO MANAGEMENT, Spring 2015. 2) Kevin Q. Wang. Style Rotation, Momentum, and Multifactor Analysis. Thesis, Joseph L. Rotman School of Management, University of Toronto

EM6: Portfolio construction of factor portfolios: Optimisation vs. tilting/scaling vs. filtering. Which approach works best when?

Supervisor	Erich Maritz
Organisation	UCT
Contact details	erich.maritz@uct.ac.za
Project Topic Title	Portfolio construction of factor portfolios: Optimisation vs. tilting/scaling vs. filtering. Which approach works best when?
Code	AQ
Category	Investments
Max students	2 groups/individuals
Description	The insights gained from factor investing have enabled exciting advances in the sphere of portfolio construction ranging from the very simple to the very complex. Albeit that some advances are quite simple their effect is still very significant. At the heart of portfolio construction lies the risk management discipline, a skill set that is becoming integral to investment management. Developing the quantitative support and the philosophical argument for an individual factor is merely the start. Judgements that are informed by experience and thorough research will lead to the most effective strategy, practises and risk management overlays to successfully harvest the premiums for a client solution. Understanding the capital market environment and the limiting elements are also crucial. The decay duration of the factor is also important in weighing up product design. The simplest approach is using a filtering method, by simply screening a selected universe based on a threshold of the metric of raw fundamental data that one is targeting. A more advanced approach is scoring and normalising fundamental data (after the requisite amount of scrubbing / winsorizing / truncating), and then using scaling factors (based on equal weighted or market capitalisation) to tilt toward a characteristic. Lastly, the most sophisticated approach would be optimisation, utilising a robust risk model. This approach gets criticised for its perception of being black-box, but has strong benefits of handling constraints fluidly and being able to allocate risk budgeting efficiently. The key however is understanding which approach works best in which context. Which variables are important to consider when deciding to use a simple or sophisticated portfolio construction methodology. Many market participants believe that South Africa's capital markets are too small to successfully extract any specific factor premiums, and this is where portfolio construction is important to shed light on how to optimally harvest returns in a systematic approach. Ultimately, successful quantitative investment managers would need to be disciplined and sharp on aspects of enforcing capacity and

	product design, and it is important that these and other dynamics are understood accurately by one's investment manager so that investment objectives become more practical and likely.
Skills required	Data analytical skills.
Data sources	Bloomberg.
Recommended reading	http://www.gestaltu.com/2012/11/equity-portfolio-optimization-with-factor-tilts.html/ https://www.maths.ox.ac.uk/system/files/attachments/593233_0.pdf

EG1: Getting to the destination – an analysis of alternative risk measures for use by long term investors

Supervisor	A/Prof Evan Gilbert
Organisation	University of Stellenbosch Business School
Contact details	egilbert@belpark.sun.ac.za; 082-331-5007
Project Topic Title	Investment Management The correct choice of risk measure for long term investors
Code	AQ
Max students	2
Description	Risk is nebulous concept, but measuring and managing it is a real challenge for investors. This project approaches risk from the point of view of a long term (>20 years) investor and requires the choice of a risk measure for use in portfolio construction and performance assessment. However it is not clear what measure of risk is appropriate for this context. Consequently the student will be required to conduct a critical assessment of the alternative risk concepts available to investors. Once identified on theoretical grounds, the optimal risk measure will be used in a backtesting exercise to test its ability to increase the investor's ability to reach their long term investment outcome.
Skills required	Ability to code in R/Python (or willingness to learn it).
Data sources	Bloomberg/Datastream/INET A/Prof Gilbert will help with sourcing the necessary data
Recommended reading	Bernstein, P. *Against the Gods: The Remarkable Story of Risk,* New York, John Wiley and Sons. Holton, G.A. *Defining Risk*, Financial Analyst Journal. Vol. 60(6): 19-25.

EG2: Adjusting for liquidity

Supervisor	A/Prof Evan Gilbert
Organisation	University of Stellenbosch Business School
Contact details	egilbert@belpark.sun.ac.za; 082-331-5007
Project Topic Title	Investment Management Adjusting for liquidity constraints
Code	AQ
Max students	2
Description	The backtesting of any investment strategy is fraught with challenges. One of these that is particularly relevant to a relatively small and highly concentrated equity market like the JSE Securities Exchange is the issue of liquidity. Liquidity is the ability to turn an asset into cash. It has three dimensions – time, price impact and size. You can, for example, transfer any asset into cash if the price is low enough (i.e. the price impact is high) or the size of the asset/the value your holding of the asset is very small – but if you're wanting to limit the price impact then you may have to wait some time – especially if you have a large asset/a lot of the asset to sell. In either event, the liquidity of an asset is not accounted for in naïve backtesting exercises where observed prices are assumed for the purposes of the exercise. Various attempts have been made to adjust for this. This study will require a review of these attempts- with a specific focus on the methodology proposed by Bailey and Gilbert (2007). The key contribution of the study will be the resolution of the issue raised by Douglas (2016) in terms of the appropriate use of the Bailey-Gilbert approach in portfolio optimisation-based back tests.
Skills required	Ability to code in R/Python (or willingness to learn it).
Data sources	Bloomberg/Datastream Various index providers e.g. S&P, FTSE/JSE (A/Prof. Gilbert will help obtain the relevant indices from these providers)
Recommended reading	Bailey, G. & Gilbert, E. 2007. *The impact of liquidity on mean reversion of share returns of the JSE*. Investment Analysts Journal. 36(66):19-29. Douglas (2016) *Evaluating the Impact of Diversification on the Risk Adjusted Returns of Factor-based Equity Portfolios in South Africa*, Unpublished 4th year thesis, Department of Actuarial Science, University of Cape Town.

GW1: Tales From The Crypto

Supervisor	Gareth Watson
Organisation	Private
Contact details	gcewatson@gmail.com
Project Topic	
Code	AQ
Max students	Can work with a single student, preference for 2 students that are willing to support each other, maximum 3 students (still separate projects, but aspects of the work may overlap so being willing to help and support each other is important)
Description	Cryptocurrencies have been a hot topic of late. There are hundreds of tradable cryptocurrencies out there, and dozens of exchanges and marketplaces on which to trade them. It is a wildly unregulated market where the Efficient Markets Hypothesis is more a punchline than anything else. Some people are making a fortune in these markets, others are not doing as well. This project looks at developing some "robo-trading" algorithms that will detect and be able to trade mis-pricing opportunities in real-time. Some of these opportunities present themselves as mispricing spreads as wide as 20%. Some are short-lived, and others seemingly persist for a while. Project will not require any real-money trading, but the output of this project should be something that the incumbent would be at least willing to put their money into - "put your money where your mouth is" principle. Work will necessarily involve plugging into real-time price and market feeds from multiple exchanges and evaluating opportunities on-the-fly. Incumbents should expect: • Quite code heavy at the start of the project (including topics such as APIs, websockets and streaming, databases and parallel processing) • Expected to gain some understanding of the way a market order book is constructed, represented and determines the "price" of an asset in the market (the same mechanics are present on most exchanges, and translate neatly to activity on the JSE) • The necessary application of different methods to find and detect mis-pricings in a multi-asset market • To work! I do not have all of the answers. Why would I ask questions if I already knew the answers? Be prepared to search, think and put in the work.

	Additional / Alternative areas of work include: • Blockchain – what is it, and why is it important • Survival of the crypto-iest – why do some cryptocurrencies succeed and others just flop • The role of blockchain and cryptocurrencies in the market, specifically the insurance industry • Cross-jurisdictional challenges in trading cryptocurrencies • The potential regulatory future for cryptocurrencies and blockchain
Skills required	65%+ in Computer Science 2 Must have obtained the Financial Mathematics exemption Must be comfortable with at least one programming language, such as Java, C#, Python or R.
Data sources	Data will not be provided, but guidance will be given in enabling the streaming of data from a number of active exchanges worldwide. Data will need to be collected for any simulations, backtests or experiments being conducted.
Recommended reading	https://github.com/ethereum/wiki/wiki/White-Paper https://hackernoon.com/the-case-for-never-ending-cryptocurrency-arbitrage-spreads-788e94441d60 https://en.wikipedia.org/wiki/History_of_bitcoin (yes, Wikipedia is useful sometimes)

JL1: Comparing the Actuarial Education approaches at different SA universities

Supervisor	Jo Legutko
Organisation	UCT
Contact details	0216502148 . Joanna.Legutko@uct.ac.za
Project Topic/ Title	Comparing the Actuarial Education approaches at different SA universities. (Education)
Code	AQ (but interest in actuarial qualification from Q students required)
Max students	Maximum number of projects: 2

Description	An investigation of the degrees offered by different SA universities, either the top 4, or all universities accredited by ASSA, or even including an overseas university for comparison. The basis for comparison includes:
	
	- What is being taught
	  - What actuarial subjects
	  - What additional subjects
	- How much is being taught
	  - The density of curriculum
	  - The number of semester courses per exemption
	- What order
	  - Which year do the different subjects get taught
	  - What is the order in which they are taught
	- What counts (?)
	  - I would like to extend this to have some measure of success. Ideas include:
	  - The number of exemptions gained at graduation
	  - The time from graduation to qualification
	
	It may be useful to include information about the demographics of the student body, and any support in place at each university.

Skills required	No particular skills
Data sources	Data: At the very least, information from the websites of the universities would be a start. ASSA could be approached for information on demographics, and on qualification rates. Universities would need to cooperate with information on exemption numbers at graduation not sure if this is possible.
Recommended reading	This work follows closely on a study done on the accounting profession by Ilse Lubbe, here at UCT. *Educating Accounting Professionals: investigating the relevance of an overloaded curriculum* *By: Ilse Lubbe, College of Accounting, University of Cape Town, South Africa* https://www.dropbox.com/s/0kb00wnfjt4jgjc/Relevance%20of%20accounting%20curriculum.docx?dl=0

JL2: Evaluating the value added by the UCT BusSci (AcSci) curriculum

Supervisor	Jo Legutko
Organisation	UCT
Contact details	0216502148 . Joanna.Legutko@uct.ac.za
Project Topic/ Title	Evaluating the value added by the UCT BusSci (AcSci) curriculum (Education)
Code	A
Max students	Maximum number of projects: 2
Description	This is an investigation of the value gained by graduates from various non-core actuarial courses offered by UCT within its BusSci (AcSci) programme. The question is, are those subjects adding value in the workplace? Which ones are more useful and which ones are less useful? What kinds of workplace/individual benefits most from certain subjects? This project should be framed in terms of graduate attributes – what attributes are employers looking for? What attributes does ASSA require from actuaries? And then understanding to what extent those attributes are developed by the UCT curriculum.
Skills required	No particular skills

Data sources	The core data for this project would be sourced from a survey of UCT graduates. The survey would need to ask:
	
	- Demographic questions to enable analysis
	- Degree related questions, like date of graduation, degree completed
	- Current work information
	  - Area of work
	  - Qualified or not
	  - What is involved in work
	- For each non-core subject, an evaluation of
	  - How useful the subject has been since graduation
	  - Why?
	- What skills would have been useful to learn at university

	The intention is that the survey will be designed and sent by the supervisor in March, so that the results are available in time for analysis.
Recommended reading	Jackling, Beverley, and Paul De Lange. "Do accounting graduates' skills meet the expectations of employers? A matter of convergence or divergence." *Accounting Education: an international journal* 18.4-5 (2009): 369-385. Jane Andrews & Helen Higson (2008) Graduate Employability, 'Soft Skills' Versus 'Hard' Business Knowledge: A European Study, Higher Education in Europe, 33:4, 411-422, DOI: 10.1080/03797720802522627 To link to this article: https://doi.org/10.1080/03797720802522627 *Educating Accounting Professionals: investigating the relevance of an overloaded curriculum* *By: Ilse Lubbe, College of Accounting, University of Cape Town, South Africa* https://www.dropbox.com/s/0kb00wnfjt4jgjc/Relevance%20of%20accounting%20curriculum.docx?dl=0

JL3: Optimum lifetime savings strategies for retirement

Supervisor	Jo Legutko
Organisation	UCT
Contact details	0216502148 . Joanna.Legutko@uct.ac.za
Project Topic/ Title	Optimum lifetime savings strategies for retirement (Retirement)
Code	A/Q
Max students	Maximum number of projects: 2
Description	There is an open question as to what is the best savings strategy over the life time. Should one start early and maintain the same savings rate throughout the working life time? Or should one save as much as possible early in life? Lifecycle consumption smoothing theories suggest that it may be useful to smooth consumption by adjusting savings rates over time. This may result in uneven savings rates over time, but a more even consumption pattern. There are also advantages in maximising consumption replacement ratios by not allowing pre-retirement consumption to increase. This project is concerned with testing out various savings strategies over a lifetime to optimize retirement outcomes. Possible approaches: a. Maximise post-retirement income subject to keeping the replacement ratio to 100% (or 80%) b. Test sensitivity to investment return levels c. Test whether buying a house should be prioritized or whether it should be simultaneous with saving for retirement d. Test whether consumption smoothing or income smoothing result in better post-retirement outcomes The idea is to test what savings strategies are optimal for retirement.
Skills required	Excel
Data sources	The data for this project would be artificially generated, based on research on income and consumption patterns over a lifetime. The idea is to have a number of test individuals with different income levels, family situations, and housing costs, and see what strategies are optimal for each.

Recommended reading	Jonathan Skinner, 2007. "Are You Sure You're Saving Enough for Retirement?," Journal of Economic Perspectives, American Economic Association, vol. 21(3), pages 59-80, Summer. Hurd, M. D. and Rohwedder, S. (2005). Changes in consumption and activities in retirement. Report, University of Michigan Retirement Research Center.

JH1: A stochastic approach to evaluating the financial profile of infrastructure projects in the South African Renewable Energy Independent Power Producer Procurement (REEIPP) project landscape.

Supervisor	Johan Human
Organisation	Alternative Investments Committee
Contact details	johan@alluviagroup.co.za
Project Topic/ Title	A stochastic approach to evaluating the financial profile of infrastructure projects in the South African Renewable Energy Independent Power Producer Procurement (REEIPP) project landscape.
Code	AQ
Max students	2
Description	**Objectives:** To consider the added advantages of a stochastic approach to valuing infrastructure projects (particularly wind / solar farms) and thus display the actuary's role in this field. This is largely a quantitative project, concluding with recommendations on the role of the actuary. **Overview and Practical applications:** The REIPPP has resulted in more than R 120bn worth of privately owned infrastructure assets being developed. The assets are ideally suited to investment by institutional investors (e.g. insurers, pension funds) as they are of a long-term nature and have inflation-linked cash flows, with downside risks well-managed. The valuation of these assets are a significant concern of asset consultants, asset managers and investors. The financial models underlying the projects are generally very detailed and well-constructed, but the valuation approach considers future cash flows and deterministic assumptions. The key residual financial risks that are important in the valuation of these assets and that can be stochastically modelled are future inflation (and interest rates) as well as wind / solar resources (which is assessed using statistical models – these are available already). The project would consider a stochastic approach to the valuation of an infrastructure asset, which is typically a wind farm or solar farm in South Africa. This could not only assist in the valuation process (and thereby facilitate price discovery, trade and investment), but also give some pointers to the structuring of future projects, where actuaries can play a more active role, given their understanding of the liabilities of institutional investors and the requirements of such investors.
Skills required	An ability to search and review literature, Excel, statistical software (e.g. SAS, R or Statistica)
Data sources	Statistical models will be supplied; other data is readily available.

Recommended reading	http://edhec.infrastructure.institute/wp-content/uploads/publications/blanc-brude_2015a.pdf http://www.clapesuc.cl/assets/uploads/2017/08/cifuentes-clapes.pdf

JH2: Requirements for infrastructure investments to be suitable for retirement funds and life insurers in the South African environment

Supervisor	Johan Human
Organisation	Alternative Investments Committee
Contact details	johan@alluviagroup.co.za
Project Topic/ Title	Requirements for infrastructure investments to be suitable for retirement funds and life insurers in the South African environment.
Code	AQ
Max students	2
Description	**Objectives:** The FSB has released a note on solvency capital requirements for infrastructure investments to *inter alia* encourage the private sector to fund public infrastructure projects. This project should consider the necessary conditions for the infrastructure investment market to become more efficient for these investors – a qualitative approach may be taken, using the FSB's note as guidance on aspects to consider. **Overview and Practical applications:** South Africa, like many other nations, has a need for further infrastructure investments – e.g. housing, water, sanitation, transport. Government has identified institutional investors (e.g. insurers and pension funds) as a key source of funding for these investments. While institutional investors have played a significant role in many of the REIPPP Projects, there remain a number of hurdles to more funds being dedicated to infrastructure investments. This project will look at the structural, legal, financial and governance requirements of institutional investors to facilitate meaningful participation in meeting the infrastructure requirements of South Africa and Africa. This can then be shared with the regulator to stimulate investment in this field.
Skills required	An ability to search and review literature
Data sources	n/a
Recommended reading	See attached note from FSB

JH3: Pension fund liquidity: Is it a problem? If so, why and how can it be managed?

Supervisor	Johan Human
Organisation	Alternative Investments Committee
Contact details	johan@alluviagroup.co.za
Project Topic/ Title	Pension fund liquidity: Is it a problem? If so, why and how can it be managed?
Code	AQ
Max students	2
Description	**Objectives:** To understand the effect of liquidity constraints on pension funds and to identify mechanisms to address these constraints. A quantitative approach may be taken for the former and a qualitative discussion may be used to achieve the latter objective – students may also rely on a significant amount of existing literature to supplement their research. **Overview and Practical applications:** One of the key concerns with both infrastructure investments and pension funds is liquidity. Infrastructure investments are suitable for pension funds due to the long-term, inflation-linked and predictable cashflows. However, for a number of reasons, liquidity (in terms of price discovery and marketability) is a concern for these investments. The research should consider the relevance of these concerns from a range of perspectives, including Solvency Assessment and Management (SAM) and other Regulations and then consider potential legal, regulatory and market mechanisms which could address these concerns of pension funds.
Skills required	An ability to search and review literature, Excel or R to model effects of constraints
Data sources	Significant existing literature available; fund flow data readily available
Recommended reading	https://www.fsb.co.za/Departments/communications/Documents/Memorandum%20to%20explain%20the%20revised%20regulation%2028.pdf http://www.itinews.co.za/content/media/companydocs/5f9cc53b-ddf5-4041-8151-2ced3b412681.pdf

LdT1: Protest Performance: Analysis of the impact of 2015 and 2016 student protests on academic performance in UCT Actuarial Science subjects

Supervisor	Landi du Toit
Organisation	UCT
Contact details	Landi.dutoit@uct.ac.za
Project Topic/ Title	Protest Performance: Analysis of the impact of 2015 and 2016 student protests on academic performance in UCT Actuarial Science subjects.
Code	AQ
Max students	3
Description	Analysis of the students' performance in actuarial science subjects in the 2015 and 2016 end of year exam period (to decide with student if this will be limited to exemption-bearing November exams and thus exam only performance, or all Actuarial Science subjects, and exam and year-marks.) Performance to be compared with at least 3 years' results prior to 2015 as well as 2017 results.
Skills required	Reasonable knowledge and ability in Excel - will need to work with a number of datasets to be cleaned and merged (from different years and subjects). Good stats knowledge and coding ability in R preferable. Ability to search and review literature.
Data sources	Actuarial Science Section Exam and Year Marks on all subjects to be included in the analysis. This will be for a total of at least 6 years and include at least all exemption-bearing November exams. Data will be anonymises. Ethics approval will be required before the release of data.
Recommended reading	Suggest search available literature on student protests (local and international) as well as literature on drivers of or events as impact on academic performance. As a start consider: Slattery, P., Dorrington, R., Zietsman, S. 2000. An Analysis of the Performance of Actuarial Students. Convention of the Actuarial Society of South Africa. Maireder, A., Schwarzenegger, C. 2011. A MOVEMENT OF CONNECTED INDIVIDUALS. Social media in the Austrian student protests 2009. N. Tausch N., Becker J.C., Emotional reactions to success and failure of collective action as predictors of future action intentions: A longitudinal investigation in the context of student protests in Germany http://onlinelibrary.wiley.com/doi/10.1111/j.2044-8309.2012.02109.x/full

LS1: Micro-lending: Banking for the "unbankable"

Supervisor	Logan Standaar
Organisation	UCT
Contact details	Logan.standaar@uct.ac.za
Project Topic/ Title	Micro-lending: Banking for the "unbankable"
Code	A
Max students	4
Description	Capitec Bank has recently surpassed ABSA in becoming the second biggest bank in SA in terms of number of customers. However, a Viceroy report published in January 2018 slammed the bank and referred to the bank as loan sharks. This has called into question the viability of micro-financing for the low-income sector. This project entails unpacking Capitec's strategy and finances whilst analysing the validity of the Viceroy report. This will require an in-depth look at banking in emerging markets around the world and taking a close look at the risks involved in the banking sector. The student will have to make solid conclusions about the future of Capitec (and similar institutions) based on the research.
Skills required	Ability to search and review literature; Analyse and interpret financial statements; Identify risks in a relatively new sector for actuaries; Ability to formulate and substantiate a well-structured argument
Data sources	All the data will be available online or in the library. Students will be given the 2017 financial reports for Capitec and will be required to download prior years from Capitec's website. The students will also be given relevant readings (about 15), which they can use in their research. Given that it is widely discussed at the moment, students are encouraged to consult other resources which are easily available online or in the media.
Recommended reading	As a start, students *must* read Chapter 7 in the following book (available at UCT library): Banerjee, A. V., & Duflo, E. (2011). *Poor economics: A radical rethinking of the way to fight global poverty*. Public Affairs. In addition, the Viceroy report of January 2018 should be read.

PO1: Option Pricing via Fourier Methods

Supervisor	Peter Ouwehand
Organisation	AIFMRM, UCT
Contact details	Peter.ouwehand@uct.ac.za
Project Topic/ Title	Option Pricing via Fourier Methods
Code	AQ
Max students	1
Description	For many models of stock dynamics, the density function of the log-stock price is not known in closed form, but the characteristic function is. Examples the Black-Scholes, Heston, Bates, Variance Gamma, CGMY, Meixner, NIG…. Since the characteristic function of a random variable is just the Fourier transform of its density function, we can use Fourier methods to rapidly compute option prices. Speed is important, because these computations are typically performed many thousands of times, when calibrating a model to market data. The aim of this project is to implement and compare a number of Fourier methods for pricing options. Unless an unexpected and spectacular breakthrough is achieved, it is unlikely to lead to publication. It's part of the toolbox of any quant.
Skills required	A solid background in mathematics and statistics. Also, good programming skills in R, Python, matlab or similar programming language. In addition, the student must sign up for the FinEcos module
Data sources	Not required.
Recommended reading	Carr, P. and Madan, D., 1999. Option valuation using the fast Fourier transform. Journal of computational finance, 2(4), pp.61-73. Fang, F. and Oosterlee, C.W., 2008. A novel pricing method for European options based on Fourier-cosine series expansions. SIAM Journal on Scientific Computing, 31(2), pp.826-848.

PB1: Cape Town water crisis – rainfall and population growth – what caused the water shortage?

Supervisor	Pieter Botha
Organisation	UCT
Contact details	Pieter.botha@uct.ac.za
Project Topic Title	Cape Town water crisis – rainfall and population growth – what caused the water shortage?
Code	A/Q
Max students	2 x 2
Description	As you are well aware (I hope!), Cape Town is facing a severe water shortage partly caused by drought being labelled as the worst in 100 years… How does recent rainfall patterns compare with those over the past 100-odd years? Is the drought really so severe, or are there other factors contributing to the water shortage? What about population growth - how has Cape Town's population grown over the last 100 years? And has fresh water supply growth kept track with growth in population (i.e. the dam storage, alternative water resources, etc.). What about climate change – how has average Cape Town temperatures changed over the last 100 years? Could this have contributed? Consumption – how does Cape Town consumption compare to that of other major metropolitan areas (locally and abroad)? How does rainfall compare in these areas and how does overall water storage per capita compare? What can we deduce from this?...
Skills required	Sleuth-like investigative skills, digging up data like a boss and analysing rainfall/temperature/population, etc. in Excel and interpreting resulting trends/patterns
Data sources	Mostly online records documented either by researchers, government/municipalities, etc. Journal articles on climate change and the impact thereof on rainfall patterns and desertification may be available on google scholar

Recommended reading	https://albertonrecord.co.za/148712/rainfall-monitor-compares-cape-town-rainfall-40-years/ http://www.weathersa.co.za/climate/historical-rain-maps https://www.news24.com/SouthAfrica/News/how-severe-is-cape-towns-drought-a-detailed-look-at-the-data-20180123 http://worldpopulationreview.com/countries/south-africa-population/ http://www.dwaf.gov.za/Hydrology/ http://www.sahistory.org.za/topic/cape-town-timeline-1300-1997 http://capetownhistory.com/?page_id=379 etc…

PB2: Implications of NHI for South Africa – Looking at the experience of other countries with similar National Health Insurance systems

Supervisor	Pieter Botha
Organisation	UCT
Contact details	Pieter.botha@uct.ac.za
Project Topic Title	Implications of NHI for South Africa – Looking at the experience of other countries with similar National Health Insurance systems
Code	A
Max students	2 x 2
Description	The second White Paper on NHI in South Africa was released in 2017 and the intention is that SA moves from the dichotomous Private/Public healthcare system to a system whereby everyone is covered for a universal basket of healthcare products and services. A number of countries across the world have similar healthcare systems, but not all of them have big success stories to tell when it comes to universal healthcare provision. Compare NHI in some of these countries to that envisioned for SA, highlighting successes and pitfalls of each, paying particular attention to the underlying populations of these countries relative to that of South Africa's population. Some countries that have universal healthcare coverage include: The UK, Netherlands, Canada, UAE, etc. have universal healthcare coverage for their citizens. How does healthcare in SA compare to that in the rest of Africa, currently and under the envisioned NHI system. Has universal healthcare been considered in other African countries and how successful have these been? Demonstrate an understanding of the role of healthcare in economic growth and overall population prosperity, and the impact of poverty on access to healthcare and the reasoning behind an NHI system. Conclude with a discussion on what NHI in the future may have in store for SA as a whole – positives, negatives, risks, opportunities, costs, etc.
Skills required	Searching and synthesising large amounts of information drawing independent conclusions. Using online resources i.e. google scholar and the library.
Data sources	Mainly online published research
Recommended reading	https://www.mm3admin.co.za/documents/docmanager/1E9AEA2C.../00126403.pdf - NHI White Paper SA 2017

	https://truecostblog.com/2009/08/09/countries-with-universal-healthcare-by-date/ https://www.pacificprime.com/country/africa/ https://ideas4development.org/en/expanding-health-insurance/

PdT1: Using expert judgement to calculate disability rates

Supervisor	Pieter du Toit
Organisation	Old Mutual
Contact details	082 773 6518 pddutoit@gmail.com
Project Topic/ Title	Using expert judgement to calculate disability rates
Code	AQ
Max students	3 groups
Description	Bayesian methods are widely used in the field of machine learning. These statistical methods prescribe how to update expert opinion on disability rates in the light of experience data - automatically and rigorously. Half of the project will be purely statistical; the other half will be spent working with medical experts to elicit prior distributions. Since this work is currently used in practice, this work has the benefit of being clearly defined.
Skills required	Limited R skills required; there may be an opportunity to learn basic Power BI. The project will touch on Markov chains.
Data sources	Data sources will be provided where necessary.
Recommended reading	Gelman A., Carlin J.B., et al. (ed. 3) (2014) Bayesian Data Analysis. CRC Press.

RD1: More boys born during the World Cup? (single student only – must have met with me beforehand)

Supervisor	Rob Dorrington
Organisation	Centre for Actuarial Research, UCT
Contact details	Rob.dorrington@uct.ac.za
Project Topic/ Title	More boys born during the World Cup?
Code	A
Max students	1
Description	Masukume and Grech published a (quick and) short paper arguing that more boys were born than expected during the World Cup in South Africa and offering explanations for this result. This project concerns examining the veracity of the claim and explanations offered. Work that results in a good final paper could lead to publication.
Skills required	Excel + an ability to apply common sense to results to interpret, how much is history and how much poor data, or invalid assumptions. (Ability to work with a statistical package (e.g. Stata) if variation in topic requires access to the 10% unit record sample)
Data sources	Census tabulations available from the Stats SA website (www.statssa.gov.za) (SuperWeb (tabulated data) and Nesstar (for unit record data). (Links at the foot of the home page)
Recommended reading	Masukume G and Grech V. 2015. "The sex ratio at birth in South Africa increased 9 months after the 2010 FIFA World Cup", *Early Hum Dev* **91**(12):807-809
Area	Demography

RD2: Completeness of SALTs (single student only – must have met with me beforehand)

Supervisor	Rob Dorrington
Organisation	Centre for Actuarial Research, UCT
Contact details	Rob.dorrington@uct.ac.za
Project Topic/ Title	Completeness of reporting of deaths used to produce South African Life Tables (SALTs)
Code	A
Max students	1
Description	Bah (2000 and 2011) has claimed past official life tables in South Africa have underestimated mortality because they assume that deaths are completely reported. However, these papers are flawed. So this project is concerned with investigating the question of whether deaths have been under-reported in the vital registration (VR) system for three population groups over one period or one population group over three periods.
Skills required	Excel and ability to learn the application of the deaths distribution method workbook from a training manual.
Data sources	Data on deaths will be provided or can be sourced from the Government publications library. Population data can be downloaded from the Stats SA website or from Government publications library.
Recommended reading	Bah, S. 2000. "A Critical Review of South African Life Tables", *Canadian Studies in Population* **27**(1):283-306 and Bah, S. 2011. "Using Model Life Tables to Assess the Plausibility of Directly-Constructed Historical Life Tables", *Southern African Journal of Demography* **12**(1):125-139 merely to appreciate the argument that there has been (apparently) under-reporting of deaths. And Death Distribution Methods from Moultrie TA, RE Dorrington, AG Hill, KH Hill, IM Timæus and B Zaba (eds). 2013. *Tools for Demographic Estimation*. Paris: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/ to be aware of the sort of (simple) techniques which should be used to determined under-reporting.
Area	(Historical) mortality

RD3: Disaggregation of change in life expectancy into main causes of death (single student only – must have met with me beforehand)

Supervisor	Rob Dorrington
Organisation	Centre for Actuarial Research, UCT
Contact details	Rob.dorrington@uct.ac.za
Project Topic/ Title	Disaggregation of change in life expectancy into main causes of death
Code	A
Max students	1
Description	Life expectancies change over time because of changes of mortality at various ages, and mortality changes at various ages because of changes in the underlying causes of mortality. It is usually difficult to assimilate all this information detail, and so Arriaga suggested a simple method for disaggregating the change in life expectancy into changes that due to causes of mortality in each of the age groups. This project is concerned with producing these numbers either for the South African population as a whole over time, or one of the population groups, or explaining the difference between life expectancies in population groups, and presenting the results in graphically meaningful ways that allow for the main features to be clearly identified.
Skills required	Excel and ability to implement a simple method in a workbook from a paper and/or manual. Ability to present results graphically informative ways. Ability to work with a statistical package (e.g. Stata) to the point that can extract deaths by broad causes of death from vital registration of deaths (VR).
Data sources	VR data from the Stats SA website. Life tables to be provided.
Recommended reading	Arriaga, E. E. 1984. "Measuring and explaining the change in life expectancies", *Demography* **21**(1):83-96. The relevant chapter in Preston, S. H., Heuveline, P. and Guillot, M. 2001. *Demography: Measuring and Modelling Population Processes.* Oxford: Blackwell.
Area	Mortality/burden of disease

RD4: Potential impact of block-chain technology on insurance (single student only – must have met with me beforehand)

Supervisor	Rob Dorrington
Organisation	Centre for Actuarial Research, UCT
Contact details	Rob.dorrington@uct.ac.za
Project Topic/ Title	Potential impact of block-chain technology on insurance
Code	A
Max students	1
Description	While debate rages about cryptocurrencies, there is little debate that the underlying idea of block-chains (distributive bookkeeping) is set to disrupt the financial services industry. This topic, thus, involves thought about how this technology/idea might impact on the way insurance might be provided in future.
Skills required	An understanding of what distributive bookkeeping entails and understanding of how insurance works, an ability to sift through the many words written about the disruptive effects of the idea of block-chains and the ability to consider how this might impact on insurance
Data sources	Not applicable
Recommended reading	Can be provided to students who are interested in undertaking this topic.
Area	Futurism

RoD1: Investigating the effectiveness of diversification strategies based on alternate risk measures

Supervisor	Rowan Douglas
Organisation	UCT
Contact details	rowan.douglas@uct.ac.za
Project Topic/ Title	Investigating the effectiveness of diversification strategies based on alternate risk measures
Code	AQ
Max students	2
Description	An important step in the process of creating a portfolio of shares is deciding how to weight the different shares in the portfolio. This step has become synonymous with the process of diversification, and the strategies for implementing this step can be called diversification strategies. The vast majority of research into diversification strategies has focused on methods which use volatility as the measure of risk. The aim of this project will be to assess how effective diversification strategies based on other risk measures, such as downside deviation, omega ratio etc., can be. The investigation will be carried out by performing a back test on historical share data to assess how the strategies perform. There is a possibility for further research and publication if the project is completed to a satisfactory level.
Skills required	The project will have a significant programming component. The programming language used will be R. As such, you should either be confident in your abilities in R, or willing to put in the effort to learn R.
Data sources	I will assist you in attaining the required data, either from industry sources or the terminals in the library
Recommended reading	Bruder, B. and Roncalli, T., 2012. Managing risk exposures using the risk budgeting approach. Dowd, K. and Blake, D. (2006), After VaR: The Theory, Estimation, and Insurance Applications of Quantile-Based Risk Measures. Journal of Risk and Insurance, 73: 193–229. doi:10.1111/j.1539-6975.2006.00171.x Copies of the readings can be requested via email.

SM1-SM3: Pricing a zero coupon bond by Fast Fourier Transforms , COS Method and Finite Difference methods when the term structure of interest rates is a mean reverting Ornstein-Uhlenbeck process

Supervisor	Sure Mataramvura
Organisation	UCT
Contact details	Sure.mataramvura@uct.ac.za
Project Topic/ Title	Pricing a zero coupon bond by Fast Fourier Transforms , COS Method and Finite Difference methods when the term structure of interest rates is a mean reverting Ornstein-Uhlenbeck process
Code	AQ
Max students	2,2,2
Description	Assume that the terms structure of interest rates is given by the mean reverting Ornstein_Uhlenbeck process with constant coefficients. It is known that the price of a zero-coupon bond priced on this term structure has a closed form solution. The aim of this project is to solve the price of the zero coupon bond by means of numerical methods and then compare the results, for some selected values of parameters, to the closed form price and to determine which numerical method performs better in terms of speed and error reduction. The following is suggested: SM1: Fast Fourier Transform (FFT) and Crank Nicolson Method SM2: COS method and Crank Nicolson method SM3: Fast Fourier Transform (FFT) and COS method Where time allows, other numerical methods can be explored as part of the student's initiatives.
Skills required	Basic derivative pricing knowledge (Fin Ecos stuff). Numerical methods proposed are not difficult to learn. You must be good at coding (R-coding or Matlab preferred)
Data sources	This is a purely theoretical exercise that may not need the use of real data.
Recommended reading	John C. Hull .Options, Futures and other derivatives S.Shreve : Stochastic Calculus for Finance II, Continuous Time Models.

VdS1: The vintage factor in South African private equity: How does our local experience compare to PE in developed markets?

Supervisor	Virgilio da Silva
Organisation	Alternative Investments Committee
Contact details	virgiliod@cadiant.co.za
Project Topic/ Title	The vintage factor in South African private equity: How does our local experience compare to PE in developed markets?
Code	AQ
Max students	2
Description	**Objectives:** To establish the extent to which the year of commencement of a private equity fund affects its eventual return, and how this differs between emerging and developed markets. This is largely a quantitative topic (methodology would be geared towards assessing the predictive power of commencement year on "long-term return" (which the student can define)) but students may find it useful to review some of the existing literature on the vintage effect available internationally. **Overview and Practical applications:** Private equity is an asset class – it thus has its own risk-return profile and can provide diversification benefits in a portfolio. With decreasing yields in some markets and a number of relatively illiquid insurance products being introduced (e.g. long-term guarantees), interest in private equity as an asset class has been increasing – it offers a potential liquidity uplift (i.e. a premium for locking away money over longer periods) and potential for higher returns (given the different risk profile). If the results provide evidence in favour of the vintage effect, a conclusion could be that investors should allocate funds across private equity funds instead of only to a single fund. This will be useful in guiding investors' (both institutional and retail) allocation to private equity in their portfolios.
Skills required	An ability to search and review literature, Excel or R for analysis
Data sources	Review of existing literature; private equity returns are available
Recommended reading	https://www.forbes.com/sites/bobhaber/2017/03/07/as-with-fine-wine-vintage-matters-for-private-equity/#3da8d27f4cd2 http://www.sib.wa.gov/financial/invrep_ir.asp https://www.chicagobooth.edu/news/2004-11-12kaplan/pereturns-1.pdf

VdS2: Is the 5% allowance for investing in Africa (according to regulation 28) better deployed using the growing market in African PE rather than listed African equity?

Supervisor	Virgilio da Silva
Organisation	Alternative Investments Committee
Contact details	virgiliod@cadiant.co.za
Project Topic/ Title	Is the 5% allowance for investing in Africa (according to regulation 28) better deployed using the growing market in African PE rather than listed African equity?
Code	AQ
Max students	2
Description	**Objectives:** To establish whether an allocation to Africa is better served, from a return perspective, by investing in private equity funds as opposed to listed equity funds. This is largely a quantitative topic but will rely on a literature review to summarise previous investigations in this field. **Overview and Practical applications:** Regulation 28 applies to pre-retirement savings and restricts allocations to offshore investments (25%) with an additional 5% that may be invested in Africa. This 5% may be invested in any asset class (subject to Regulation 28 limits) including listed equity and private equity. This topic compares the difference in return between allocating the entire 5% to listed equity investments versus private equity investments. The results of the research will provide evidence for which route is more preferable (to "optimise" this 5% allocation to equity investments).
Skills required	An ability to search and review literature, Excel or R for asset allocation analysis
Data sources	Review of existing literature; private equity returns are available
Recommended reading	http://www.itinews.co.za/content/media/companydocs/5f9cc53b-ddf5-4041-8151-2ced3b412681.pdf https://www.moneyweb.co.za/investing/the-case-for-alternative-investments/ https://www.moneyweb.co.za/investing/the-case-for-alternative-investments/ https://www.prudential.co.za/insights/articlesreleases/regulation-28-what-does-it-mean-for-investors/

YM1: Optimal hedge fund investment methods: Can South African fund of hedge funds add alpha compared to single manager selection? Are fund of hedge funds' returns driven primarily by manager selection or strategy selection?

Supervisor	Yonela Makwetu
Organisation	Alternative Investments committee
Contact details	yonela@novare.com
Project Topic/ Title	Optimal hedge fund investment methods: Can South African fund of hedge funds add alpha compared to single manager selection? Are fund of hedge funds' returns driven primarily by manager selection or strategy selection?
Code	AQ
Max students	2
Description	**Objectives:** To identify whether alpha (outperformance relative to the market) for fund of hedge funds is more driven by manager selection or strategy selection and to understand the main drivers of returns for fund of hedge funds. The former may be studied by assessing the predictive power of manager and strategy selection respectively on alpha (performance above a benchmark) and the latter could be approached more qualitatively (identify and define the main drivers for fund of hedge funds, particularly relative to conventional hedge funds). **Overview and Practical applications:** The research will help to better understand fund of hedge funds' returns (what drives the outperformance, etc.) and assess whether investors should better spend their time selecting strategy or managers. This will help guide positioning portfolio allocation to hedge funds to "optimise" alpha generation.
Skills required	An ability to search and review literature, Excel or R to model drivers
Data sources	Fund of hedge fund returns are published for different strategy types
Recommended reading	https://global.pimco.com/en-gbl/insights/viewpoints/in-depth/a-quantitative-framework-for-hedge-fund-manager-selection https://www.cfapubs.org/doi/full/10.2469/dig.v38.n3.2 https://www.man.com/how-to-pick-a-quantitative-hedge-fund

YM2: Historical hedge fund returns in SA: Is there evidence of performance persistence over the long-term, and how does it vary by strategy and size? Is mean reversion no longer a factor, and what does that imply for market-neutral strategies? How much of the equity long- and short-term returns can be attributed to beta?

Supervisor	Yonela Makwetu
Organisation	Alternative Investments committee
Contact details	yonela@novare.com
Project Topic/ Title	Historical hedge fund returns in SA: Is there evidence of performance persistence over the long-term, and how does it vary by strategy and size? Is mean reversion no longer a factor, and what does that imply for market-neutral strategies? How much of the equity long- and short-term returns can be attributed to beta?
Code	AQ
Max students	2
Description	**Objectives:** To find evidence for or against persistence in long-term performance of hedge funds. The focus is on quantitative factors including beta contribution to strategy returns (over the long- and short-term), mean reversion for market-neutral managers (i.e. managers that take long and short positions to get exposure to market price increases and decreases) as well as fund strategy and size (i.e. assets under management, AUM) and their influence on performance. **Overview and Practical applications:** Investors seek alpha (i.e. outperformance relative to the market) from their hedge fund investments. The hedge fund industry has been under scrutiny due to poor performance – whether this is cyclical or structural is yet to be determined. This research will highlight potential underlying constraints that may hinder the long-term performance of hedge fund strategies and thus motivate the case for allocations to hedge funds.
Skills required	An ability to search and review literature, Excel or R for analysis
Data sources	Hedge fund returns and portfolio allocations readily available
Recommended reading	https://open.uct.ac.za/bitstream/item/5709/thesis_com_2013_dube_c.pdf?sequence=1 http://wiredspace.wits.ac.za/xmlui/bitstream/handle/10539/23212/MASTER%20THESIS.pdf?sequence=1&isAllowed=y https://ujcontent.uj.ac.za/vital/access/services/Download/uj:16238/SOURCE1

YM3: The South African hedge fund market compared to other emerging market hedge fund markets: Focusing on the growth of the industry, concentration of asset managers / strategies, opportunity set and regulations.

Supervisor	Yonela Makwetu
Organisation	Alternative Investments committee
Contact details	yonela@novare.com
Project Topic/ Title	The South African hedge fund market compared to other emerging market hedge fund markets: Focusing on the growth of the industry, concentration of asset managers / strategies, opportunity set and regulations.
Code	AQ
Max students	2
Description	**Objectives:** To evaluate the growth of the local hedge fund industry in comparison to other emerging markets. Key focus is on comparing the growth of the industry, concentration of asset managers / strategies, opportunity set (i.e. what is available), regulation (e.g. recent split of hedge funds into those suitable for professional investors and those for lay investors) and performance between South Africa and other emerging markets. This is largely a literature review of existing research. **Overview and Practical applications:** This topics seeks to answer questions such as: Why have certain markets grown faster than others? What have been the obstacles to and opportunities (e.g. to attract more local and foreign inflows) for growth in hedge funds? What can the South African market learn from its peers? Which emerging market attracts the most foreign flows and why? As an output, investors will be able to use the research to understand the local industry relative to other emerging markets (to get a geographic understanding) and fund managers can learn about key areas for improvement / development going forward.
Skills required	An ability to search and review literature, Excel or R for analysis
Data sources	Topic is a review of existing literature
Recommended reading	http://fairtree.com/wp-content/uploads/2016/12/sanne_connect_winter_2016_FINAL.pdf https://repository.up.ac.za/bitstream/handle/2263/23879/dissertation.pdf;sequence=1 https://www.fanews.co.za/article/investments/8/general/1133/hedge-funds-is-sa-playing-second-fiddle/20761

Further topic ideas and supervisors

Alternatively, should you wish to do a topic that may interest an appropriate person outside the university, or a lecturer in another department, e.g. Mathematics, Statistics, Information Systems, Economics, etc., you should contact her or him with the proposed topic and discuss availability as supervisor. If you propose your own topic, you need to agree the topic with the potential supervisor and confirm availability to supervise before you seek out approval. Ideally, the supervisor should complete the topic template along the lines of those above and submit this to the course convenor as soon as possible after presentation of the topics to ensure the suitability of the topic for a 4th year project.

Topic choice forms

BUS4029H and BUS 4129H(only):Topic choices 2018

Please complete this form and hand it in to Nikki Cavernelis in LC 5.40, by **12:00 on Monday 12 March 2018**.

Although we will endeavour to assign you the topic of your first choice this cannot be guaranteed at all, and we will not enter into any discussion on the matter afterwards.

If you wish to choose a topic that is not one of the topics identified in the list by a code like **DS2**, give a description of the topic, name your proposed supervisor, and confirm that the proposed supervisor is agreeable. Please provide your proposed supervisor's contact details so that we can make him/her aware of our specifications. In other respects, follow the standard instructions.

Name(s): _____

Student number(s): _____

Email address(es): _____

Cellphone number(s): _____

Course code: BUS4029H /BUS 4129H

Choose exactly one topic (A or AQ) from each of the following internal supervisors:

CM	EM	JL	LdT	PB	RD	SM	LS	RoD

Now state your first choice from all A and AQ topics:

State also four other topics you like, from all A and AQ topics:

(At least one of these three choices must be a topic of an external supervisor.
An external supervisor is one who does not work for UCT Actuarial Science full time.)

BUS4053H and BUS4153H (only):Topic choices 2018

Please complete this form and hand it in to Nikki Cavernelis in LC 5.40, by **12:00 on Monday 12 March 2018.**

Although we will endeavour to assign you the topic of your first choice this cannot be guaranteed at all, and we will not enter into any discussion on the matter afterwards.

If you wish to choose a topic that is not one of the topics identified in the list by a code like **DS2**, give a description of the topic, name your proposed supervisor, and confirm that the proposed supervisor is agreeable. Please provide your proposed supervisor's contact details so that we can make him/her aware of our specifications. In other respects, follow the standard instructions.

Name(s): _____

Student number(s): _____

Email address(es): _____

Cellphone number(s): _____

Course code: BUS4053H/BUS4153H

Choose exactly one topic (Q or AQ) from each of the following internal supervisors:

EM	SM

Now state your first choice from all Q and AQ topics:

State also four other topics you like, from all Q and AQ topics:

(At least one of these three choices must be a topic of an external supervisor.
An external supervisor is one who does not work for UCT Actuarial Science full time.)