



UNSW Actuarial, Finance, Risk and Insurance Congress

SUMMARY

UNSW Actuarial, Finance, Risk, and Insurance Congress

DATE

Monday, 24 July 2023 – Friday, 28 July 2023

VENUE

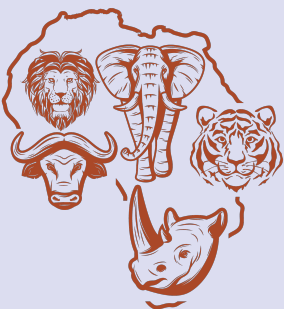
Elephant Hills Resort, 328 Park Way Drive, Victoria Falls, Zimbabwe

REGISTRATION

CONTACT

School of Risk & Actuarial Studies, UNSW Sydney

1. Maree Withers, m.withers@unsw.edu.au
2. Jonathan Ziveyi, j.ziveyi@unsw.edu.au



AFRIC

Thank you to our generous sponsors

Platinum Sponsor



School of Risk and Actuarial Studies,
UNSW Sydney



Commercial Bank of Zimbabwe (CBZ) Holdings Limited

Gold Sponsors



AFIR | International Actuarial
Association



IFID Centre

Silver Sponsors



Department of Econometrics
and Business Statistics, Monash University



Claxon Actuaries International



UNIVERSITY OF ZIMBABWE

University of Zimbabwe

Bronze Sponsors



Society of Actuaries



Institute and Faculty of Actuaries



ASTIN | International Actuarial
Association



The Institute of Actuaries in Belgium (IA|BE)



Old Mutual Insure



Casualty Actuarial Society



University of



PhD Forum and Best Paper Gifts



Katholieke Universiteit Leuven



UNSW
SYDNEY

Alexis Levendis: Static Hedging of Non-Exchange Traded Options in South Africa

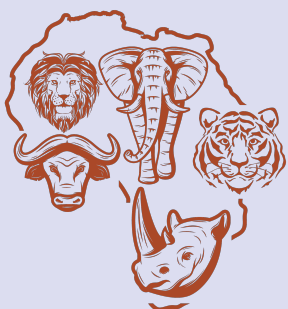
Abstract

Static hedging is the strategy of replicating a written option without the need to rebalance the asset portfolio at frequent dates. In South Africa, the traditional delta-hedging approach is often preferred since the underlying equity can be traded without major liquidity constraints. However, delta-hedging can be a costly approach. Static hedging, on the other hand, requires a relatively liquid derivatives market, since the written option will be replicated by a combination of other options, futures, and cash, for example. Unfortunately, the derivatives market in South Africa is illiquid, which makes the static hedging approach challenging. In this contribution, we consider the sale of a non-exchange traded European call option on the FTSE/JSE ALSI index and construct a static hedging portfolio consisting of at-the-money exchange traded European call options on the FTSE/JSE Top40 index and cash. To test the performance of the static hedging program, we calibrate the stochastic volatility double jump (SVJJ) model to historical FTSE/JSE ALSI index prices using the efficient method of moments (EMM) to simulate realistic real-world paths. Next, we calibrate the SVJJ model to the FTSE/JSE Top40 implied volatility surface which allows us to price the exchange traded options under the so-called risk-neutral measure. We also propose a simple scaling approach based on the relationship between the real-world and risk neutral SVJJ models for the FTSE/JSE Top40 index to price the written option, since no volatility surface exists for the FTSE/JSE ALSI index. Our static hedging approach entails finding the minimum cost of constructing the hedging portfolio, subject to the value of the hedging portfolio being greater than or equal to the value of the written option at some future date. The approach considers the illiquidity of the South African market, hence adding some illiquidity premium to the option price. Static hedging has the potential to aid option writers sell off-market and more complex options by approaching pricing from a hedging perspective.

Andrés Villegas: Estimating and Modelling Mortality Rates in the Absence of Population Denominators

Abstract

Mortality statistics are important indicators of the health and well-being of a population. The mortality rate is estimated by calculating the ratio between the number of occurred deaths and the size of the population. One major hurdle is that data on the denominator, i.e., the actual size of the population of interest, if available at all, can often be of poor quality and spills over to the estimation of the mortality rate. In this paper, we propose a way to estimate mortality rates by using death counts only, i.e., without the use of population size information. The major 'trick' is to interpret the sampling scheme as a right truncation problem within a survival analysis framework and to estimate the hazard function in reversed age-time. Thus, by



AFRIC



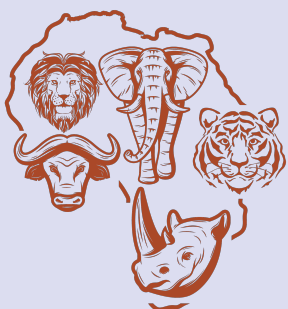
UNSW
SYDNEY

analogy to the standard (forward) force of mortality and (forward) central mortality rate, we introduce the concepts of reverse force of mortality and reverse central mortality rate. Different structural assumptions on the hazard function will allow to move from reverse-time quantities back to forward-time quantities. We first illustrate our approach using data from the Human Mortality Database (<https://www.mortality.org>) and compare our mortality estimates with the estimates from traditional approaches that do make use of population denominators.

Annamaria Olivieri: Disclosing the Reserving Process in Life Insurance Through Periodic Fees

Abstract

In the liability-driven life insurance business, i.e., when benefits are fixed or participating, the reserving process follows a prospective approach; this could make cryptic the dynamics of the policy account value to the policyholder, unless he/she holds an actuarial background. In particular, the correspondence between the costs described under policy conditions and the amount accumulated into the policy account value may be lost. Conversely, in the asset-driven life business, i.e., when benefits are unit-linked, by constructions the reserve takes the value of the policy assets. In this case, the fees charged periodically to the policy account value, to cover the costs of any guarantee and rider benefit provided, turn out to be disclosed to the policyholder. Regardless of the policyholder's ability to assess whether the fees are fair or not, this approach makes the reserving process rather intuitive. Further, the way fees are applied is like that of financial products, to which very often individuals compare life policies, as in their view they can represent a convenient alternative. The policyholder's understanding of the reserving process is especially important when there are participation mechanisms or surrender benefits, due to the role of the reserve in such respect. Whatever the rule adopted to calculate the reserve, its dynamics can be reinterpreted in terms of an equivalent periodic fee charged to the policy account value. Disclosing the equivalent periodic fee presents pros and cons for the insurer. Innovations could be introduced in the policy design, in particular allowing forms of flexibility regarding the timing of the choice of guarantees and rider benefits, similarly to Variable Annuities. On the other hand, the equivalent periodic fee may lead to a greater awareness of the costs charged by the insurer; reasonably, the dynamics of the equivalent periodic fee is affected by the time-profile of the cost of mutuality, the conservative assumptions required for reserving, as well as by the insurer's profit target. Being able to justify such a dynamic is important for the insurer, as the calculation of the equivalent fee can be made autonomously by the policyholder, once informed of the current policy account value and the asset return. We investigate this issue, regarding participating endowments, and participating and longevity-linked annuities. Our research aim is to better understand which opportunities and drawbacks arise for the insurer from the disclosure of the equivalent



AFRIC



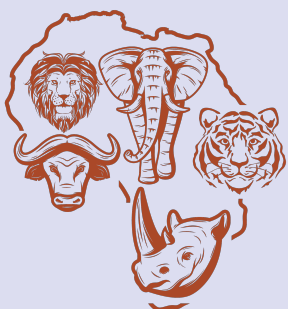
UNSW
SYDNEY

periodic fee when the reserving process follows a traditional valuation approach.

Annika Krutto: How Accurate and Reliable is miRNA Testing in Predicting Disease Risk and how can it be Best Integrated into Health and Life Insurance Decision-Making? A Heavy-Tailed Perspective

Abstract

The use of genetic testing in health and life insurance has been the subject of much research in recent years. Health and life insurance companies may use genetic testing to determine an individual's risk for certain health conditions, which can influence their decision on whether to offer coverage and the cost of the coverage. miRNA (microRNA) is a type of genetic material that regulates gene expression and can play a role in the development of various diseases. The rapid progress of high-throughput sequencing techniques has greatly impacted the field of genetics, including the analysis of microRNAs (miRNAs). It enables the efficient and cost-effective analysis of large amounts of genetic data, providing an in-depth understanding of genetic regulation and the role of miRNAs in disease. Blood-based miRNA testing involves analysing a blood sample to detect changes in the levels of specific miRNAs and has the potential to offer many benefits in the early detection of cancer, including improved sensitivity and specificity compared to other testing methods, and the ability to detect changes in miRNA levels long before physical symptoms of cancer appear. Catching cancer earlier is one of the most effective ways to improve survival. However, the accuracy and reliability of miRNA tests are still being evaluated, and more research is needed to determine the best way to use the information they provide in insurance decisions. Additionally, ethical and privacy concerns have been raised about the use of genetic testing in health insurance, as some fear that the information gathered could be used against individuals in discriminatory ways. As a result, many countries have enacted laws and regulations that restrict the use of genetic information in insurance decision-making. This research focuses on the practical applications of miRNA testing, and specifically seeks to examine the miRNA data from a "heavy-tailed perspective." This perspective may be relevant in the context of miRNA testing, as it could allow for a more nuanced understanding of the results and their potential implications for health and life insurance decision-making. The results of this research could contribute to the development of evidence-based guidelines for using miRNA testing in health and life insurance and help ensure that this technology is used in a responsible and effective manner.



AFRIC



UNSW
SYDNEY

Ayse Arik: The Effect of the COVID-19 Health Disruptions on Breast Cancer Risk: A Semi-Markov Modelling Approach

Abstract

In this study we propose a methodology to quantify the impact on breast cancer mortality of diagnostic delays caused by public health measures introduced as a response to the COVID-19 pandemic. These measures seriously affected cancer pathways by halting cancer screening, delaying diagnostic tests, and reducing the numbers of patients starting treatment. We construct a semi-Markov model to quantify the impact of the pandemic based on publicly available population data for women in England and relevant medical literature. We quantify age-specific excess deaths, for a period up to 5 years, along with years of life expectancy lost and change in cancer mortality by cancer stage. We also consider the effect of the current pandemic on the pricing of related life insurance products, such as breast cancer life insurance.

Blessing Mbukude: Regulating for the Millennial Pensioner

Abstract

How is the Millennial Different?

The millennials are threatening the current pension products and the current structures in place for retirement planning. Their view of life makes all current pension models unsustainable into the futures and also exposes many of them to high dependency on government support. Their approach to life is breaking from the norm, and with that rebellious trajectory, the status quo may also change. The key detrimental traits are:

1. Save less
2. Own less assets
3. High job migration
4. Work less
5. More focused on work-life balance
6. Less community centred
7. Lower fertility

With medical advancements, we also expect the millennial Pensioner to have much higher life expectancy compared to the current generations. In 2021, around 70 percent of millennial respondents from the United States stated that they participated in fitness sports, making them the generation with the highest participation rate. This even adds to the general wellness.

How do we regulate retirement planning?

Retirement planning is one industry that is well regulated and supported through tax incentives. Due to the long term view of the product, regulation is required to ensure that the money will be there when it's required – sometimes 40 years into the future. But based on the progression of the population dynamics, there is need to ensure that the regulations don't lag behind. This presentation seeks to



AFRIC



UNSW
SYDNEY

explore ways in which pension regulation can be augmented to suit the upcoming millennials who are set to retire in the next 30 to 50 years.

Claude B. Moutsinga: A Time Multidomain Spectral Method for Valuing Affine Stochastic Volatility and Jump Diffusion Models

Abstract

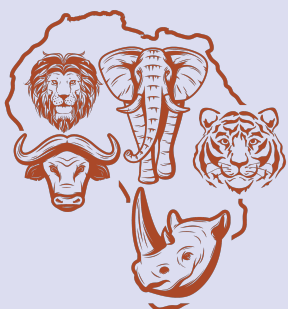
The general form of existing multivariate are based on stochastic volatility and jump diffusion models. These models are widely used in financial engineering for pricing derivatives, risk management, and asset allocation. The way to handle them typically lead to the need of solving systems of stiff Riccati differential equations. In this talk, we propose a time spectral domain decomposition method for solving systems of stiff Riccati differential equations. The technique is applied to solving stiff diffusion model problems.

found in oil pricing, interest rate and electricity models. Numerical methods show that the present approach is efficient, highly accurate and a good alternative to the existing numerical methods.

Colin Ramsay: Exploring the Impact of Quality of Care in a Multi-State Long Term Care Model

Abstract

A major problem facing many U.S. retirees is accessing and paying for long term care. The 2019 National Association of Insurance Commissioners (NAIC) guide on long term care insurance estimates that, of the individuals living in the U.S. who reach age 65, about 70% are expected to need some form of long-term care at least once in their lifetime and about 35% are expected to enter a nursing home at least once in their lifetime. Unfortunately, the arrival of COVID-19 pandemic in the US has highlighted the importance of quality of long-term care. In the early stages of the pandemic, it disproportionately affected residents and staff in long term care facilities, accounting for 6% of all cases and 38% of all COVID-19 deaths. Empirical studies have consistently found a positive correlation between rising reimbursement rate and quality of long-term care Yet, there is very little actuarial research on the impact of quality of care on long term care outcomes. Specifically, outside of their own research, the authors know of no explicit actuarial model that explores the connection between, cost of care, quality of care provided, and long-term care outcomes. To explore these connections, we use a multi-state model of long-term care with health states that are based on a retiree's ability to perform activities of daily living (ADLs), instrumental activities of daily living (IADLs), and cognitive ability. In addition, we explicitly model how the quality of long term care a retiree receives affects the retiree's health state transition probabilities used in the multi-state model. As higher quality of care usually comes at a higher cost but with better health outcomes, we provided an example that explores an expected discounted utility maximizing retiree's optimal choice of long-term care.



AFRIC



UNSW
SYDNEY

Daniel Linders: The P2P Pandemic Swap: Decentralized Pandemic-Linked Securities

Abstract

In the wake of the 2014 Ebola outbreak, the World Bank created the first ever pandemic bond in 2017, an innovative solution to provide emergency financing to poor countries facing pandemic risk. However, the bond has been slow to payout in the COVID-19 pandemic, drawing mounting criticism for failing to deliver its promise of emergency funding. Many called for structural reforms of the pandemic bond to address fundamental flaws of the funding mechanism exposed by COVID-19. The paper presents a new class of pandemic-linked securities which combine financial derivatives for pandemic risk with a peer-to-peer (P2P) structure. The P2P structure offers more flexibility with payment triggers catering to the needs of individual countries and better inclusion of co-funding agencies beyond investors. The work is intended to bring fresh perspectives to the ongoing debate on the development of international framework for health emergency preparedness and response.

Delfim Torres: A Stochastic Capital-Labour Model

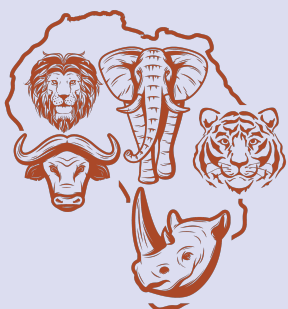
Abstract

We propose and study a stochastic capital-labour model with logistic growth function. First, we show that the model has a unique positive global solution. Then, using the Lyapunov analysis method, we obtain conditions for the extinction of the total labour force. Furthermore, we also prove sufficient conditions for their persistence in mean. Finally, we illustrate our theoretical results through some numerical simulations.

Diana Skrzydlo: Aligning Assessment for Aspiring Actuaries

Abstract

In a day of your life as an actuarial practitioner or researcher, how much time do you spend answering closed-ended questions with one correct answer? If, as I suspect, the answer is very little or none, why do many actuarial educational and credentialing programs weigh these skills so heavily? There should be space for creativity and nuance in actuarial education, just as there is in actuarial work and research. We should be looking for students with strong professional and ethical values as well as technical skills. And there must be alignment between the skills future actuaries will need, what is taught in educational programs, and how actuarial students are assessed in their classes. Some encouraging progress has been made in many actuarial organizations, and it can go farther still. In this talk I will discuss several concrete ways, both large and small, that educators can teach and assess their students in more authentic ways, so that



AFRIC



UNSW
SYDNEY

we develop the next generation of thoughtful, professional, ethical actuaries who will continue to advance the profession.

Doreen Kabuche: Linking Annuity Benefits to Financial and Longevity Experience: A Joint Assessment Framework

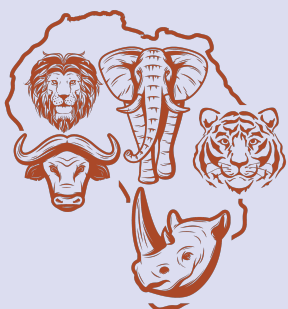
Abstract

The demand for the longevity guarantees provided by traditional annuities remains low, possibly because of high costs, despite the protection they can offer to individuals at old age. Conversely, longevity-linked products providing reduced guarantees are gaining popularity, due to lower costs. However, relaxing longevity guarantees implies that the benefit amount can be decreased, while it is necessary to preserve a lifetime benefit above a minimum amount. We consider longevity-linked solutions joint to financial participation. Indeed, participating life annuities, where the benefit is subject to an increase linked to a financial performance, are traditional in many markets. The joint presence of a longevity and financial linking can benefit from compensation effects between the relating profits and losses, resulting in lower fees required. First, we investigate the benefit dynamics comparing the cases of financial participation only, longevity-linking only and financial and longevity-linking jointly. Then, we assess the fees required for alternative levels of the guarantee and participation, addressing a structure with periodic fees, charged to the policy fund value. We adopt an affine stochastic model, in particular the arbitrage-free Nelson-Siegel (AFNS) framework, that we calibrate on European interest rates and Italian mortality rates. The numerical results highlight the risk-return trade-off for the provider and the policyholders implied by the alternative choices of guarantee and participation level.

Edward Chamisa: IFRS adoption, enforcement, and the value relevance of accounting amounts: The case of South Africa

Abstract

South Africa (SA) adopted International Financial Reporting Standards (IFRS) for listed firms effective 1 January 2005. However, it was not until 2011 that substantial financial reporting enforcement changes were introduced, which were meant to ensure compliance with IFRS. This innovative setting allows us to examine the value relevance of accounting amounts during the (1) pre-IFRS adoption period (2002- 2004); (2) post-IFRS adoption, but pre-enforcement changes period (2006-2010); and (3) post- enforcement changes period (2011-2012). The results show that accounting amounts were most value relevant in the post-enforcement changes period (R² , 75.5%) compared to both the pre-IFRS adoption period (adjusted R² is 24.3%), and the period after IFRS adoption but before enforcement changes (adjusted R² is 37.5%). Also, during the 2008 financial crisis, the equity book value per share was significantly value relevant (at 1%) but not earnings per share, whereas before the crisis, the opposite was true. We make two important contributions to the literature. First, we identify SA as an innovative setting that allows



AFRIC



UNSW
SYDNEY

researchers to examine *separately* the effects of IFRS adoption and enforcement changes on capital markets and accounting quality. This is a departure from prior studies that are dominated by the European Union setting where IFRS adoption occurred contemporaneously with enforcement and other regulatory changes. Second, we provide preliminary findings which suggest that while the adoption of IFRS seems to have improved the financial reporting quality of accounting amounts of SA listed firms, its impact appears to be limited unless combined with effective enforcement.

Edward (Jed) Frees: Algorithmic Commercial Risk Retention

Abstract

Commercial organizations face many risks such as damage to their buildings due to fire, liability resulting from management misbehaviour, and threats external to the organization such as cyber-attacks. Firms have financial responsibility for these risks, they 'own' them, and so it is natural to refer to the collection of these many risks as a portfolio. Analogous to the familiar asset portfolio allocation methods, this paper shows how risk managers can use constrained optimization algorithms to provide guidance on the amount of risk to retain or transfer. Using a case study, we are largely able to corroborate the work of expert risk brokers who make risk retention decisions using their extensive experience and knowledge of the worldwide insurance marketplace. Moreover, this insurance framework supplements their work by emphasizing the risk versus return/cost trade-off and offering data visualization educational tools that help improve managers' financial literacy.

Elvira Sojli: Time-Varying Group Unobserved Heterogeneity

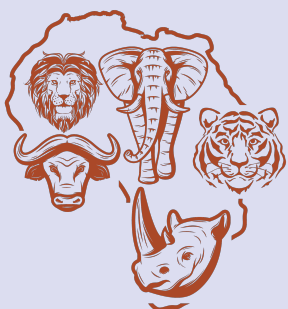
Abstract

Accounting for time-varying unobserved heterogeneity poses a fundamental challenge for accounting and business research. We implement and show the relevance of grouped fixed effects (GFE) models in empirical settings. GFE models are a general, flexible, robust, and parsimonious class of fixed effects models, which capture a richer set of time-varying unobserved heterogeneities. We extend GFE models to jointly account for time-varying unobserved heterogeneity and simultaneity bias building a two-stage least squares estimator, propose a new Hausman-type specification test to select among fixed effects models, study the finite sample properties of GFE models through simulations, and empirically demonstrate their economic importance.

Etienne Marceau: Collective Risk Models with FGM Dependence

Abstract

We study copula-based collective risk models when the dependence structure is defined by a Farlie-Gumbel-Morgenstern copula. By leveraging a one-to-one correspondence between the



AFRIC



UNSW
SYDNEY

class of Farlie-Gumbel-Morgenstern copulas and multivariate symmetric Bernoulli distributions, we find closed-form expressions for the moments and Laplace-Stieltjes transform for the aggregate random variable defined from collective risk models with Farlie-Gumbel-Morgenstern dependence. Furthermore, even if the Farlie-Gumbel-Morgenstern copula may only induce moderate dependence, we illustrate through numerical examples that the cumulative effect of dependence can generate large ranges of values for the expected value, the standard deviation, the Tail-Value-at-Risk and the entropic risk measure of aggregate loss random variables within these collective risk models.

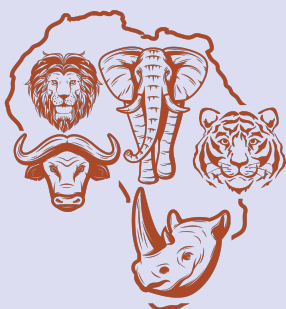
Eugene Msizi Buthelezi: Impact of Fiscal Consolidation on Domestic Government Debt in South Africa 1979 to 2022

Abstract

This study investigated the impact of fiscal consolidation on government debt and economic growth in South Africa. Fiscal consolidation is a fiscal policy that is used to reduce government debt through the cut in government expenditure and increase in tax. The rationale is that cut in spending finance by debt will reduce the interest rate there by increasing the permanent income, economic growth, result to more tax return for government thus reducing government debt.

There has been growing interest in how to measures discretionary action of fiscal authority in the effort to ascertain fiscal consolidation episodes and its impact on macroeconomic variables. One of the key measures of fiscal consolidation is Cyclical Adjusted Primary Balance (CAPB). However, the problem identified is that the CAPB measure fiscal consolidation with constant elasticity. Secondly, there is no clear explanation of the threshold that can be attributed to fiscal consolidation episodes. This may lead to inconsistent and bias of identifying fiscal consolidation episodes. Thirdly South Africa government debt is at a high level which is above 60%. Moreover, there is no policy which outlined a specific cap of government debt. Lastly, economic growth has been below 5% despite this rate been outline to the desirable one in the National Development Plan 2013. Therefore, it is critical to access the impact of fiscal consolidation on economic growth in South Africa.

The key economic questions and objectives of this study: what time varying elasticity of the CAPB that can be attributed to desecration action of fiscal authorities which can be attributed to fiscal consolidation effort. What is the threshold that can be attributed to fiscal consolidation? What is the impact of fiscal consolidation in different state of government debt? What is the impact of fiscal consolidation of economic growth? The study adopted that International Monetary Fund (IMF) framework of CAPB in the effort to examined time-varying elasticity as well as CAPB threshold. There is a used of the government budget contain in the effort to investigate effect of fiscal consolidation on government debt. There is a used of the Cobb–Douglas



AFRIC



UNSW
SYDNEY

framework to assesses impact of fiscal consolidation of economic growth.

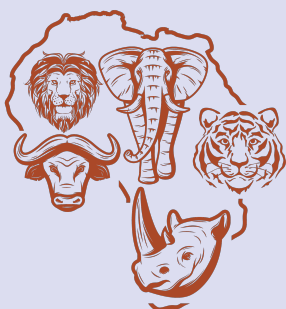
The models that are adopted are in line with the economic questions and objective name: Time-Varying Parameter Structural Vector Auto-Regression (TVP-VAR) model, Threshold Autoregressive Regime (TAR), Markov-switching dynamic regression (MSDR) and the Two-Stage Least Squares (2SLS). The TVP-VAR provide evidence that IMF data for the CAPB with constant elasticity ran over 23 years. While the one estimates in this study run for 43. There is a 56.26% variation in the CAPB with time-varying elasticity and there is a 2.36% variation in the CAPB of the IMF data that have constant elasticity. Using the TAR, it is found that there is a threshold of -1.28168%, 1.9182%, and 1.9270% for the CAPB of total government revenue increase, government expenditure cut, and the CAPB as a sum of both revenues as well as expenditure, respectively. These thresholds are different to the threshold of 1.5% advocated in literature. The MSDR showed that there are 3 states of domestic government debt characterized by the mean of 31.15%, 44.48% and 72.39% respectively. In the state 1 fiscal consolidation of government expenditure cut increases domestic government debt. In the second state, fiscal consolidation of tax increase results in a decrease in domestic government debt, and fiscal consolidation of government expenditure cut increases domestic government debt in state 3. The 2SLS showed fiscal consolidation using both some government expenditure cut and increase in tax have negative and positive when the threshold of government debt is 30% and 70%. On the other hand, fiscal consolidation has negative impact on economic growth.

It recommended to move away from using the constant elasticity, because time varying elasticity capture more discretionary action that can be attributed to fiscal consolidation episodes. Given the threshold found country based fiscal consolidation threshold need to be used then relaying on literature to identify threshold. The states of domestic government debt be considered in the implementation of fiscal consolidation. Moreover, less, or no used of fiscal consolidation in need in the effort to reduce government debt. Fiscal consolidation can be used a high level of government debt, fiscal consolidation can be used as a policy instrument to increase economic growth in the context of the South Africa economy.

Fahad Javed Malik: Addressing the Availability and Affordability Crisis of Home Insurance in Flood-Prone Areas of Australia

Abstract

Australia is a coastal country with much of its population living on or near the coast, which makes it vulnerable to the impact of climate change. Rising sea levels pose a significant threat to the country's critical infrastructure, and flooding caused by extreme weather

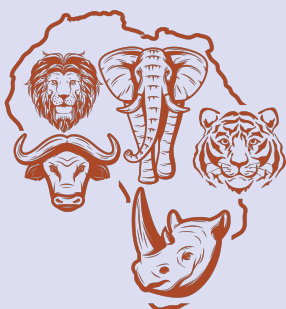


AFRIC



UNSW
SYDNEY

events is the most immediate and serious consequence of this threat. Apart from the negative impacts on health and well-being, damage to coastal ecosystems, and disruptions to people's lives, the economic losses caused by damage and destruction to coastal infrastructure can be substantial. One of the major challenges facing Australia is the insurance affordability and availability crisis, which has become more pronounced due to the increasing frequency and intensity of extreme weather events. The article suggests that one way to address this crisis is by implementing improved mitigation measures, such as building codes and emergency management plans, to better protect Australia and Australians from extreme weather events. The article explains the impact of climate change, followed by the factors that influence the impact of climate change on extreme rainfall. It provides an overview of the CAT 221 – NSW and South-East Queensland Floods Mar/Feb 2022, which is the main catastrophic event of focus. The economic cost in the top 10 affected local government areas (LGA) is identified, and the Lismore LGA, which suffered the second greatest loss at \$508 million, is further investigated for the home insurance crisis. The cost of home insurance has surged from about \$1400 annually to \$15,000 yearly, including flood cover, while home and contents insurance now costs \$25,000 in flood-ravaged Lismore. The cost has doubled or tripled for some policyholders. The article found that homeowners in flood-prone areas of Lismore LGA are receiving widely varying insurance quotes for the same properties, raising questions about whether insurers are accurately pricing for billion-dollar flood risk and affordability. We conducted a shadow shopping exercise that confirmed for the same value house and contents and similar structural features, Australia's biggest insurers were quoting between AUD 5,000 and AUD 37,000 for a year of flood coverage. To address the crisis in home insurance, the article suggests using the Computable General Equilibrium (CGE) modelling technique. CGE modelling is a powerful tool in public policy that simulates the overall impact of economic policy changes on the economy. It can be used to analyse the impact of changes in government policies, such as changes in regulations or subsidies, on the affordability of home insurance. We have applied CGE model estimate the impact of the buy-back scheme on government spending, as the government would need to purchase properties and potentially provide compensation to homeowners. This would allow policymakers to evaluate the costs and benefits of the buy-back scheme and determine whether it is a cost-effective solution to the home insurance affordability and availability crisis. By reducing the number of homes in high-risk flood areas, the government buyback policy can help to lower the cost of flood insurance. With fewer homes at risk of flooding, insurers may be able to offer more affordable insurance policies to homeowners. We have also recommended to incorporate more granular data such as satellite imagery into the assessment process for a buy back scheme can help to ensure that the scheme is targeted effectively, and that the prices offered for buy back are reflective of the actual flood risk faced by each property. This can help to improve the efficiency and effectiveness of the scheme, while



AFRIC



UNSW
SYDNEY

also helping to ensure that it is viewed as fair and transparent by the public.

We have also proposed a flood index that is like the Actuaries Institute Climate Index. The use of a flood index is also proposed, which considers a range of factors that contribute to flood risk at the individual property level. One of the key advantages of the flood index is that it can be used to create more accurate flood maps, which can be used by insurance companies to accurately assess flood risk and determine insurance premiums. This can ensure that insurance premiums are fair and accurately reflect the true flood risk of a property, rather than relying on postcode-based classifications that may be inaccurate. The flood index can help reduce variability in home insurance premiums in flood-prone regions of Australia by providing a more accurate assessment of the flood risk of individual properties.

Overall, addressing the issue of extreme weather and its impact on insurance affordability and availability is a complex challenge that requires a multifaceted approach. Implementing practical measures to reduce risk and working together with insurers to manage exposure can work towards a more resilient and sustainable future for all Australians. By using CGE modelling and a flood index, policymakers can evaluate the potential impact of different policy options and make informed decisions to address the insurance affordability and availability crisis

Fangda Liu: Model Uncertainty and Applications in Insurance Design

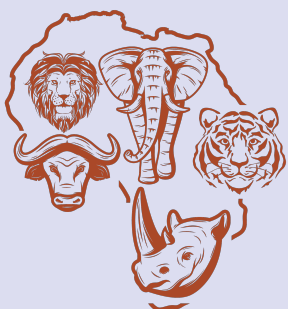
Abstract

The model uncertainty is of crucial importance when market participants are making risk management strategies. For a participant who adopts law-invariant risk measures for quantification, the study of the supremum of risk measure values can help the participant to better understand the performance of risk in the worst-case scenario. In this talk, we introduce several model uncertainty settings. The choices of risk measures, uncertainty sets, and transformations of the underlying risk play important roles in the characterization of the worst-case distribution. Motivated by the insurance policies, we mainly focus on stop-loss functions and limited loss functions. Furthermore, we discuss the optimal retention levels for participants in an insurance policy with model uncertainties.

Fono Louis Aime: On a Model of a Cooperative Game with Multiple Cooperations for the Analysis of the Intermediated Insurance Market

Abstract

Eckardt [Eckardt M. (2007) Insurance intermediation: An Economic Analysis of the Information Services Market, In Contributions to Economics Series 22, Springer, Physica-Verlag] analysed an insurance market with an insurer, an insured and an intermediary. She proposed a condition for which insurer and insured benefit from the intermediary exchange (exchange among insurer, insured and an



AFRIC



UNSW
SYDNEY

intermediary). Although her framework is the first one which considers intermediary exchange in an insurance market, its deeply analysis reveals that she studies a particular case where an insurance market with three players (an insurer, an insured and an intermediary) and there is not an underlying appropriate formal formalism of her framework. In this paper, we propose cooperative game theory with multiple cooperation for $n+2$ ($n \geq 1$) players (one, insurer, n insureds and one intermediary). More precisely, we introduce first notions on cooperative games with multiple cooperation and we establish conditions of non-emptiness of the core for the new game. We propose an application of the obtained theoretical results for the study of the stability of insurance markets with intermediary. Our obtained applied results generalize those of Eckardt (2007).

Franck Adekambi: An Analysis of the Value of Equity-Linked Death Benefits Based on the Exponential Levy Process

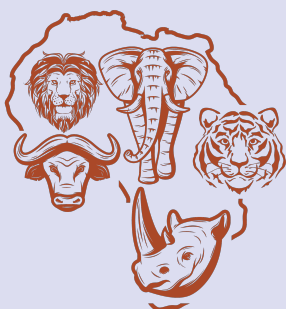
Abstract

In this study, we analyse the valuation of equity-linked death benefit contracts. We provide explicit formulas for the expectation of the discounted payment of the guaranteed minimum death benefit products under the exponential Lévy process assumption for the stock price process and a Kn family distribution (i.e., the Laplace transform of their density function is a ratio of two polynomials of degree at most $n \in \mathbb{N}$) for the time until death. For call, put and surrender/laps contracts, we provide closed expressions.

Hamza Hanbali: Mean-Variance Longevity Risk-Sharing for Annuity Contracts

Abstract

This paper investigates longevity risk-sharing as a solution to the sustainability and affordability problems in the annuity market, and how much longevity risk should be transferred back to policyholders under a mean-variance utility framework. First, it provides risk-sharing rules for annuity products priced under a dynamic equivalence principle. Second, it studies the contract properties from the perspectives of both the provider and individual policyholders. Third, in policyholders' decision, it highlights and accounts for two levels of uncertainty and two levels of correlation induced by systematic longevity risk. Fourth, it provides necessary and sufficient conditions on the premium loading and the share of transferred risk, such that both parties prefer the dynamically updated annuity over its traditional counterpart. The results of the paper offer a deeper understanding on the preferences of each party regarding longevity risk-sharing, as well as on the complex effect of systematic and diversifiable risks on those preferences. The analytical results are supplemented with a numerical study showing that the area defining the viable risk-sharing (i.e., the combination of the loading and the share of transferred risk) is larger when the policy includes payments



AFRIC



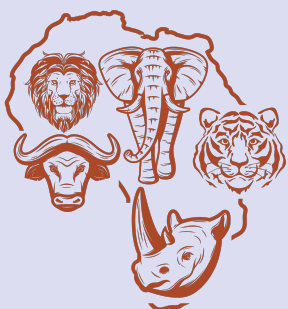
UNSW
SYDNEY

at higher ages. This indicates that the products presented in this paper are suitable retirement solutions.

Idelia Hoberg: South African Sovereign Credit Risk Contracts

Abstract

Sovereign credit risk represents the potential adverse impact should a government default on its debt either because they are unwilling or unable to meet interest or principal payments. The detrimental impacts of the efforts of the sovereign to avoid default on the economy and capital markets may also be considered as an occurrence of sovereign credit risk event. Sovereign credit risk events may take many forms and the definition thereof is not straight forward, however, the cost of default can be immense. The cost of default may include loss of access to capital markets, increased borrowing cost, economic damages and reduced economic activity, secondary impacts on local banks, other actions to avoid default and the fees incurred in creditor lawsuits in the case of default. Insurers and retirement funds are exposed to sovereign credit risk not only through direct investments into government bonds, but also because of the economic impacts, government responses and market participants and clients' responses to a sovereign credit risk event. As such, it is important not only to consider the direct risk of default of the government, which can be assessed using credit risk modelling techniques, but also the indirect cost in terms of the economic impacts because of a sovereign credit risk event, which can be assessed through stress and scenario testing. The South African government has been downgraded in 2020 to BB- by S&P (stable) and Fitch (negative) and Ba2 (negative) by Moody's. In 2021 and 2022 Moody's and Fitch revised their rating outlook to stable from negative. Since Covid-19 the gross debt to GDP ratio has worsened and based on the 2022 budget it was about 70 % of GDP in 2021/22, whereas it was around 30% in 2009 and around 50% in 2015. The 2022 budget indicates that it will stabilise at 75% in 2024/25. High debt to GDP ratios tend to be used as indicators for the likelihood of government default events. However, this does not consider the cost of debt servicing, which depends on the interest charged on government debt, and the ability of government to meet these payments, which depends on revenue. As such, debt servicing cost as a % of government revenue is a better indicator of the likelihood of government default. For South Africa this measure increased substantially from 9.6% in 2008 to 19.6% in 2022. The higher the ratio, the more government will be constrained from allocating revenue to more essential government expenditure (such as social grants, etc.) and investment into the economy, which poses other socio-economic risks and increases the need for further debt, perpetuating the problem. In South Africa, it is also important to consider that there have been a series of bailouts for state-owned entities (SOEs) like Eskom, South African Airways and most recently also SASRIA. Furthermore, the government has guaranteed certain parts of SOE debt, and as such, these obligations should be considered as an extension of their obligations. South African banks



AFRIC



UNSW
SYDNEY

held on average more than 20% of their assets in government debt in 2020, which is high compared to historical levels. This has been noted as a potential concern by the South African Reserve Bank ("SARB"). The substantial amount that local banks have invested into government debt may be considered as a source of systemic risk in the South African financial market and is an area which this working group proposes to be investigated further. Furthermore, certain insurance or pension product features in the South African market, for example life insurance products with guarantees that rely on hedging with interest rate instruments, are more heavily exposed in a sovereign default event.

Isabel Linda Zulu-Moyo: Economic Capital as an Optimal Hedge Against Bank Distress: Case of the Zimbabwean Banking Sector

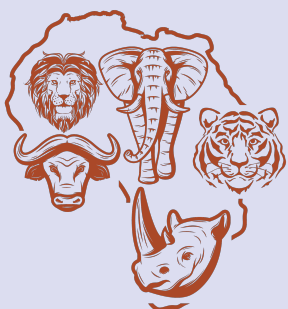
Abstract

As part of the Basel's requirements and expectations for financial stability, a bank must calculate its own economic capital (EC) using internal models. This paper proposes the use of a Bayesian Network model and accounting tools to estimate EC for Zimbabwean banks incorporating microeconomic factors to address the true risk profile involved in the profitability and solvability of banks. Bayesian Networks as graphical modelling tools were used to model the economic relationships of 20 financial ratios of 17 Zimbabwean banks that were operational between years 2010 to 2017. Credit ratings for the banks were included for analysis as the networks built are also used to rate banks when new information about that bank is received. Some financial institutions tend to hold too low or excess levels of capital which has its own associated costs. The Bayesian network built revealed dependencies of a few factors, which were then used to estimate the Economic Capital (EC). The EC model built proposed banks to keep capital more than the regulatory capital, so that banks have a buffer to hedge against liquidation risk (capitalisation), which was the main contributing factor towards bank failures during and after the 2008 financial global crisis. Capitalisation issues were addressed, and it was discovered that poorly capitalised banks were under distress. The results also revealed different levels of financial risk and different credit risk management styles that were being employed within the Zimbabwean banks, as was shown by the banks' RORAC measures and the Z-scores calculated.

Jan Dhaene: An Axiomatic Theory for Comonotonicity-Based Risk Sharing

Abstract

We investigate the quantile risk-sharing rule introduced in Denuit, Dhaene & Robert (2022). This rule is not actuarially fair, but instead satisfies another type of fairness, which is comparable with "solvency fairness" in classical centralized insurance. New properties are investigated, and an axiomatic theory is developed for the quantile risk-sharing rule, which allows for a deeper understanding of its



AFRIC



UNSW
SYDNEY

proper use. The axiomatic characterization of the quantile risk-sharing rule is based on aggregate and comonotonicity-related properties of risk-sharing rules.

Jerry Parwada: Informal Foreign Currency Exchange Rate Transparency and Remittance Flows in Zimbabwe

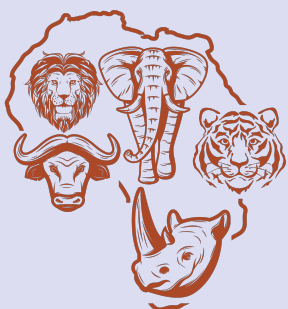
Abstract

This research explores the interplay between the Zimbabwe stock market returns volatility and GDP volatilities with other interrelated trading partners dotted in separate continents (namely, the US, South Africa, Botswana, and China). The dynamics of cross-country volatility spill overs among these countries is carried out by employing quarterly data from 2009 to 2020 by employing Multivariate volatility models. It has been established that there exist significant own-mean spill overs effects in all the ten series from GDP growth to stock market returns implying a lagged influence between GDP volatility and stock returns volatility. On the other hand, country specific cross-mean spill overs from stock market returns towards GDP growth exist in both the US, South Africa, and China. The USA economic performance has an influence on all the four countries with the strongest effect exerted on the South African economy. Of much interest is the bidirectional impact of the USA and China economies on each other with China having the least impact on the USA. Country specific volatility and covolatility transmission within and across all the ten series are positive and statistically significant. This is evidence sanctioning the close relationship between covolatility of both GDP growth and stock market return series shared by these five countries.

Jonathan Ziveyi: Innovative Combo Product Design Embedding Variable Annuity and Long-Term Care Insurance Contracts

Abstract

This paper presents a novel combo insurance product design which consists of a variable annuity contract embedded with guaranteed minimum income benefit and long-term care insurance riders. This combo product provides leveraged benefit when the policyholder is functionally disabled. We model mortality and morbidity risks by a 4-state Markov chain disability transition model, which is calibrated to the latest available data from the University of Michigan Health and Retirement Study. The Hamiltonian Monte Carlo (HMC) simulation technique is utilised for numerically pricing the combo product. HMC is a proven computational technique for simulating high dimensional distributions. Its convergence speed is fast, and the sample shows very-low autocorrelation. Cost efficiency analyses relative to long-term care annuities (long-term care insurance combined with fixed annuities) reveal that the combo product is attractive to policyholders and providers. Sensitivity analysis with respect to various model parameters provides a comprehensive analysis of the pricing and risk management of the product.



AFRIC



UNSW
SYDNEY

José Miguel Flores-Contró: The Role of Direct Capital Cash Transfers Towards Poverty and Extreme Poverty Alleviation - An Omega Risk Process

Abstract

Trapping refers to the event when a household falls into the area of poverty. Households that live or fall into the area of poverty are said to be in a poverty trap, where a poverty trap is a state of poverty from which it is difficult to escape without external help. Similarly, extreme poverty is considered as the most severe type of poverty, in which households experience severe deprivation of basic human needs. In this article, we consider an Omega risk process with deterministic growth and a multiplicative jump (collapse) structure to model the capital of a household. It is assumed that, when a household is not trapped, its capital surplus grows exponentially, whereas once trapped, the capital grows linearly only due to the external support of direct transfers (cash transfers) of money provided by donors or governments. Under this model, we derive closed-form expressions for the probability of extreme poverty, which only depends on the value of the capital at that time given by some extreme poverty rate function. For different extreme poverty rate functions, we present numerical examples to illustrate the role of cash transfers on extreme poverty dynamics.

Karim Barigou: Gaussian Process-Based Mortality Monitoring Using Multivariate Cumulative Sum Procedures

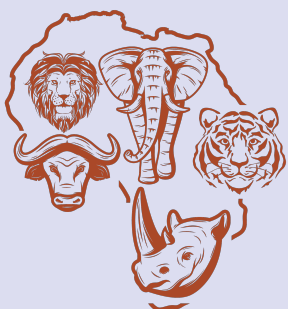
Abstract

This paper presents a multivariate cumulative sum (MCUSUM) procedure to detect changes in mortality intensity, which plays a critical role in risk management for insurance companies and pension funds. The MCUSUM algorithm is built on Gaussian process-based non-parametric mortality forecasts and tracks differences between predicted and realized mortality rates in real-time. Unlike univariate methods, the MCUSUM accounts for interdependence between age-groups and provides a more comprehensive analysis of mortality trends. The efficacy of the MCUSUM method is demonstrated through a comparison to univariate control charts and a case study of recent mortality data in France, Japan, Canada, and the USA.

Kristina Sendova: A Case Study on how Prepared Canadians are for Retirement

Abstract

In this talk, we present work that was done by members of Canada's Financial Wellness Lab at Western University in Canada. We first describe a data set with daily transactions that clients are making within investment portfolios. We then apply a ruin theory model to predict the evolution of the funds in these portfolios. Finally, we link



AFRIC



UNSW
SYDNEY

these results back to individual clients to help them evaluate their preparedness for retirement.

Laura Gonzalez-Villa Puchades: Assessing Policyholders' Acceptance of Life Settlements in Spain using a Technology Acceptance Model

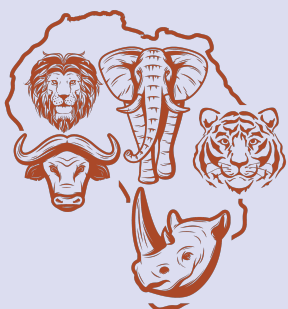
Abstract

Life settlements are not present in Spain. Therefore, they can be seen as a novel and innovative financial service in this country. This consideration motivates this work that analyses the key factors, from the seller's perspective, for the development of a secondary life insurance market through life settlements in Spain. To do so, we use consumer-behaviour findings from academic research on the acceptance of new financial techs and services. Our analysis is grounded on the Technology Acceptance Model developed by Davis (1989) further extended by Venkatesh et al. (2003) and it is adjusted by means of a Partial Least Squares - Structural Equation Modelling. Results show that relevant variables to use life settlements are Performance Expectancy, Expected Easiness and Social Influence constructs. Ethical Problems are not relevant in the decision of accepting life settlements.

Michael T. Tichareva: Opportunities for Applying Actuarial Techniques in Banking

Abstract

This paper discusses opportunities for the application of actuarial techniques in banking practice for actuaries. It has been produced by the Banking Forum of the International Actuarial Association and the contributions come from experienced actuarial practitioners in different jurisdictions. The paper provides literature and guidance for actuaries working in the banking industry, both as a reference point and for purposes of continuous professional development (CPD). It may also be useful for non-actuaries working in banking risk management, actuaries considering working in banking, and actuarial associations considering an involvement in the domain of banking. The topics covered are wide-ranging, illustrating the need for high-level analysis, synthesis, and application of judgement in solving complex problems in banking using both quantitative and qualitative techniques. Where appropriate, relevant background, including regulatory frameworks, is given to put things into context and to showcase how the skills and expertise of actuaries are relevant, or can be relevant, in the various scenarios.



AFRIC



UNSW
SYDNEY

Munir Hiabu: On Functional Decompositions, Post-hoc Machine Learning Explanations and Fairness

Abstract

In the last decade machine learning algorithms have shown unprecedented accuracy in a variety of applications and tasks. However, current state-of-the-art machine learning algorithms are black-box models. As such, they make it seemingly hard to understand the relationship between predictors and response.

Current post-hoc machine learning explanations usually only focus on explaining an approximation of the fitted model or merge interaction effects into local explanations.

In this talk I will discuss that if predictions are the composition of low dimensional structures, then interpretation of the exact model is possible via a functional decomposition of the output function. A functional decomposition unifies the notion of local explanations, global explanations, and causal effects. The latter can be used for individual fairness considerations and discrimination-free pricing. Examples of machine learning predictors that are compositions of low dimensional structures are gradient boosting machines and random planted forests.

Mwizere Rene: Long-term Sustainable Investment for Retirement

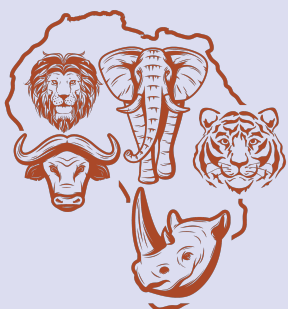
Abstract

The study will examine the long-term performance of a retirement pension fund based on ESG investment strategy. We investigate the hypothesis that the accumulated value of an ESG-screened long term pension fund is significantly different than the accumulated value of a fund with conventional investment. Critics of sustainable investing claim that the application of non-financial factors in investment selection reduces overall performance and affects returns. We will investigate empirically whether the inclusion of ESG factors in long-term investment strategy makes a significant difference in performance. Moreover, we will analyse the sustainable performance of ESG funds against their peers during global downturns such as the Covid-19 pandemic and the 2008 financial crisis. The results of this study could encourage ESG-screened investment that will contribute to achieving ESG objectives and encourage companies to address the impact of climate change, inequalities, and misrepresentation.

Ndava Constance Mupondo: GDP Growth and Stock Market Volatility Spill Overs Between Zimbabwe and the United States of America, South Africa, Botswana, and China

Abstract

This research explores the interplay between the Zimbabwe stock market returns volatility and GDP volatilities with other interrelated trading partners dotted in separate continents (namely, the US, South Africa, Botswana and China). The dynamics of cross-country volatility spill overs among these countries is carried out by employing



AFRIC



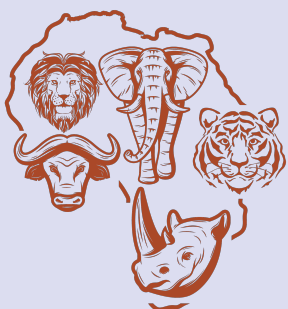
UNSW
SYDNEY

quarterly data from 2009 to 2020 by employing Multivariate volatility models. It has been established that there exist significant own-mean spill overs effects in all the ten series from GDP growth to stock market returns implying a lagged influence between GDP volatility and stock returns volatility. On the other hand, country specific cross-mean spill overs from stock market returns towards GDP growth exist in both the US, South Africa and China. The USA economic performance has an influence on all the four countries with the strongest effect exerted on the South African economy. Of much interest is the bidirectional impact of the USA and China economies on each other with China having the least impact on the USA. Country specific volatility and covolatility transmission within and across all the ten series are positive and statistically significant. This is evidence sanctioning the close relationship between covolatility of both GDP growth and stock market return series shared by these five countries.

Noreen Watyoka: Climate Change Adaption Strategies in Influencing the Inclusion of Natural Disruptions Insurance in Zimbabwe

Abstract

Extreme climate change has affected the global community and studies have shown that emission of gases due to human involvement in the industrialization is the main cause. This in turn has caused the global warming that has resulted in tropical cyclones, earthquakes, high temperatures and floods. The African continent is the most affected globally even though its contribution to the global warming is far lesser than any other continent. Zimbabwe being an African country is among the poor countries that are affected by the climate change since it is an agro based economy. The insurance industry is best sector known to handle risk transfer mechanism but there is no such cover in the country. The research seeks to find out the effectiveness of the current strategies to mitigate the effects of climate change that are in use and possibility of the government's involvement in insuring such risks. A mixed research approach was used in this research and a census was carried on twenty Operations Managers in the Zimbabwean Insurance industry. The data was analysed using NVivo for qualitative and STATA for quantitative. The results showed that the insurance sector does not have the financial muscle to insure natural disruptions since it is an actual exclusion in their coverage. The researchers recommend the involvement of the government insuring such risks and new policies to be formulated that can capacitate insurers to insure such risks. The study will assist by ensuring that the external threats like health and economic are minimized.



AFRIC



UNSW
SYDNEY

Oriol Zamora Font: Change of Measure in a Heston-Hawkes Stochastic Volatility Model

Abstract

We consider the stochastic volatility model obtained by adding a compound Hawkes process to the volatility of the well-known Heston model. A Hawkes process is a self-exciting counting process with many applications in mathematical finance, insurance, epidemiology, seismology, and other fields. We prove a general result on the existence of a family of equivalent (local) martingale measures. We apply this result to a particular example where the sizes of the jumps are exponentially distributed.

Patricia Lindelwa Makoni: Revisiting the ODA-FDI Nexus in Developing African Countries

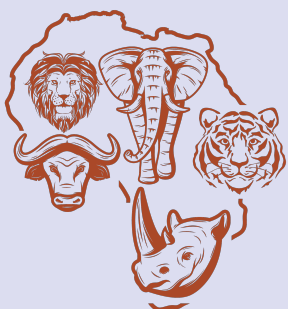
Abstract

Developing countries are increasingly seeking to wean themselves of official development assistance (ODA), by exploring ways of attracting inward international capital flows in the form of foreign direct investment (FDI). This is largely driven by the acknowledgement that ODA is not a progressive form of financial support for countries, as it does not contribute to their respective macro-economic development growth agendas, and merely ensures an ongoing dependency syndrome. As such, this paper seeks to examine the ODA-FDI nexus for a panel of selected African countries, over the period 1990 to 2018. Applying the dynamic two-step system Generalised Method of Moments (GMM) econometric technique, we assess the deterministic relationships between these two key variables, with the view to identifying commonalities and deviations that can improve respective economic growth plans. The contribution of the paper is premised on its confirmation of the key drivers that give rise to ODA and FDI, so that scholars and policymakers are better informed on which factors to focus their efforts on, when formulating and implementing investment policies which seek to spur economic growth. Hence, there is a need to continuously examine ODA and FDI flows and their role in sustainable economic development of emerging countries, which is aligned to the UN's SDGs.

Paulina Nangoloa: Optimal Portfolio Selection of a Constant Proportion Portfolio Insurance When Asset Follows Hawkes-Jump-Diffusion

Abstract

We study the firmly of risk asset in the constant proportion portfolio insurance (CPPI) trading strategy in Hawkes-jump-diffusion model where the price of the underlying asset may experience negative jump. We solve the dynamic of risk asset and cushion by using a mean version stochastic differential Equation under Geometric Brownian Motion. The main goal of portfolio insurance is to protect investor against adverse market movement. Therefore, the investor



AFRIC



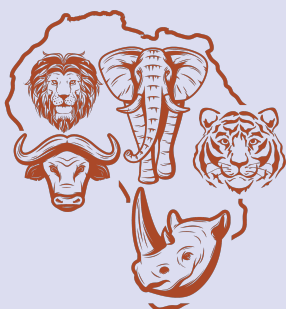
UNSW
SYDNEY

chooses the floor level depends on her risk preference and always try to maintain it through-out the trading period up to the maturity date, so that the Portfolio value will always lies above it. Within this framework we consider the problem of optimal Portfolio construction through the dynamics programming and its associate HJB equation of a two-dimensional to solve the supreme of portfolio weights by considering an investor of log, power, and exponential utility function. It was observed that, the higher the value of volatility and jump size, the less the expected terminal portfolio. Therefore, the best payoff can be achieved with the increase in number of rebalancing, the optimal portfolio weights. Whatever types of investors we have under the utility function, the investor would rather stake his wealth in a non-jump model rather than in the discontinuous one.

Peter Bhibhi: Assessing the Perception of Farmers Towards Peer-to-Peer Insurance Scheme; for the Development of an Innovative Peer-to-Peer Insurance Scheme for Smallholder Farmers in Zimbabwe

Abstract

Agriculture is a significant contributor to Zimbabwe's economy; it employs almost two thirds of the country's working population. The sector contributes about 8% to GDP. Farmers, mostly in developing countries, are frequently exposed to the risks and uncertainties of weather, prices, and diseases. Despite exposure to various risks and uncertainties, farmers in Zimbabwe, according to a survey by IFAC in February 2022, has a low uptake (3%) of insurance products and offerings. Insurance is one of the strategies to manage risk and falls under a risk transfer strategy; with the other two strategies being risk mitigation and risk coping. Various insurance schemes are in existence in the market; and these include formal insurance vehicles formed by insurance companies and informal insurance schemes such as peer to peer insurance scheme. Peer to peer insurance arrangements involves a group of farmers coming together and pull base resources together and use such contributions to cover losses from insured activities in the event of a mishap from a contributing member. The concept is borrowed from the partnership form of business ownership. One of the pre-requisites for one to join an insurance scheme is trust to the insurer especially on the accountability aspect of insurance schemes. Peer to peer insurance schemes thus eliminates the investment company and manage resources as a group. The Zimbabwean insurance sector has been on a brink of fall post adoption of the multi-currency system in 2009. Most participants have lost their investments in various insurance schemes and thus trust and confidence were lost to irreparable levels. To manage that, the government in 2015, has set up the Justice Smith's commission of enquiry that sought to advise the government on how the value of insurees can be restored. In 2022, IPEC and IFAC had a partnership exercise that sought, among other issues, to assess risks faced by farmers in Zimbabwe, gauge farmers' appetite for agricultural insurance to protect their livelihoods, help farmers develop a regulatory framework and enabling environment



AFRIC



UNSW
SYDNEY

for agricultural insurance and determine the features of insurance products appropriate for Zimbabwe's farmers.

This research seeks to evaluate the perception of farmers on peer-to-peer insurance scheme as a risk management strategy. The study will be carried out in the Midlands Province, Zimbabwe. Multi-stage sampling technique will be used. A total of 130 farmers will be used as respondents. Primary data will be mainly used and collected through a well-structured questionnaire. SPSS will be used for data analysis using descriptive statistics. An innovative peer-to-peer insurance scheme model will be developed based on results on farmers perception to the insurance scheme.

Rhoda Dadzie-Dennis: Portfolio Optimization Under Climate Change

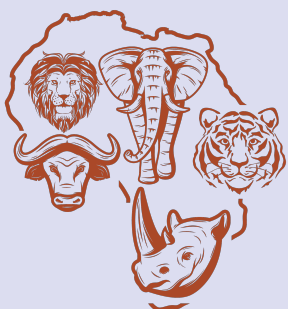
Abstract

Climate change poses challenges to every industry sector, causing significant risks to the financial market. Such risks include, for example, business disruptions from the increased frequency and severity of extreme weather events (i.e., physical risks) and high costs related to the transition to a low-carbon economy (i.e., transition risks). In this study, we consider the impacts of climate physical and transition risks, based on climate scenarios consistent with the 2015 Paris Climate Agreement, on the assets of an institutional investor. We conduct a GICS sector analysis to capture the impact of climate change risks on these sectors and the resulting impacts on an optimal portfolio. We consider both deterministic and stochastic transitions then compare the respective impacts on the optimal portfolio. Our case study shows that the financial markets will undergo significant structural changes if the sectors are reluctant to proactively adjust to climate change but then are forced to make the transition in the future. Specifically, measured by VaR and CTE, our case study shows that delaying action heightens the risks to the financial sector and to the entire economy. Our investigation aims to help investors understand the short-term and long-term trade-off of adjusting investment strategies to climate change. As a result, this study improves investors' ability to measure their exposures to climate risks.

Rob Rusconi: The Contribution of Insurers to Systemic Risk: A Practical Framework for Regulators

Abstract

While insurers are not typically the most significant contributors to systemic risk, their actions and behaviour may materially contribute to such risk. This study proposes a framework for identifying the ways in which insurers might contribute to systemic risk and considers the models that may be used to detect systemic risk originating in the insurance market. It applies this framework to the insurance market in South Africa.



AFRIC



UNSW
SYDNEY

Rodrigue Kazzi: Assessing Tail Risk for Unimodal Right-Skewed Distributions

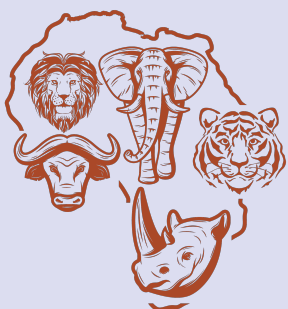
Abstract

The insurance market is innovating at a very fast pace. Accompanying the emerging products come new challenges for capital adequacy. Indeed, the lack of experience in modelling new risks can result in a significant misestimation of capital requirements. The norm is to assign a loss model to each risk (individual or aggregate). However, choosing the loss model can be an issue when only limited information is known about the risks, when dealing with new risks. We propose a new approach where we consider all models that are consistent with some available partial information and derive the maximum value the Value at-Risk can reach over these models. This maximum can be used as a benchmark to prevent excessive under- or overestimation of capital requirements. The novelty of the approach resides in the various pieces of information that can be selected. We are concerned with insurance losses, and hence we focus on unimodal right-skewed distributions. In addition, the modeler can choose a transformation, or a set of transformations, that is deemed to transform the loss distribution to a symmetric one (such as the logarithmic and power transformations). Furthermore, partial information on the median, interquartile range, and the moments (such as finiteness or range of values) can be added. We illustrate our findings using real-world datasets.

Ruediger Kiesel: Prolegomenon for Managing Climate Risk

Abstract

We put climate risks in the perspective of model risk using a model in the wide sense. Climate risks are systemic risks and may be clustered according to so-called volatilities, uncertainties, complexities, and ambiguities (VUCA) criteria. The dominating VUCA component of climate risk is uncertainty. As capital-based risk measures are not appropriate when facing deep uncertainties (unknown unknowns), precautionary and resilient principles should be applied to manage and mitigate climate risks. Within the pre-commitment approach (PCA) subjective probabilities allow to discriminate between tolerable risks and acceptable ones. Typically, solvency capital ratios are determined for acceptable risks (known unknowns). The amount of determined solvency capital and estimations of model risk (for a model in the wide sense) may be aggregated by means of a multiplier approach. This framework is in line with the three Pillar approach of Solvency II, especially with the recovery and resolution plan. Furthermore, it fits smoothly to a hybrid approach of micro and macro prudential supervision.



AFRIC



UNSW
SYDNEY

Ruodu Wang: Some Recent Results on the Axiomatic Theory of Risk Measures

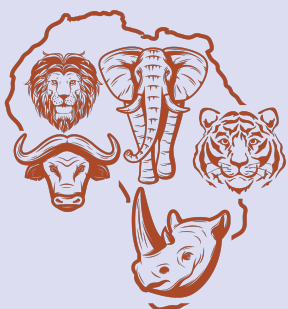
Abstract

In this talk I will summarize recent advances on the axiomatization of risk measures, including VaR, ES, expectiles, and many others, based on some joint papers in the past few years. These characterization results and their economic interpretations arise from statistical, operational, financial and optimization considerations.

Salvatory Kessy: Averaging Mortality Rates from Multiple Starting Points

Abstract

An important aspect of estimating many commonly used mortality models is selecting the time-period used for fitting. This is especially important in the light of changing mortality trends. For trend extrapolation, this requires determining the length of the base period. Many mortality models proposed in the literature assume a random walk with drift for trends to forecast mortality rates. For this assumption, mortality rate forecasts are highly sensitive to the calibration period, especially with changing mortality trends and structural changes in mortality patterns. One approach to this problem is to average forecasts from the same model across multiple starting points to account for numerous structural changes and the impact of the fitting period. We use this approach with Generalized Age-Period-Cohort (GAPC) mortality models to obtain mortality forecasts by averaging the same model across multiple calibration periods. We propose and assess three different choices of the combination weights. In the first scheme, we generate the forecast combination by using equal weights to average the individual forecasts; the second weighting method assigns heavier weights to predictions that use more recent data; and in the third approach, we determine the forecast combination by using cross-validation weights to average the individual forecasts. To illustrate the approach, we focus on three GAPC models: the Lee-Carter model, Age-Period-Cohort (APC) model, and the Plat model. We apply our method to Australian female data from the Human Mortality Database because the Lee-Carter model trend is non-linear and shows structural changes. In the out-of-sample forecast analysis, we find that combining forecasts from multiple fitting periods produces a lower mean squared error of mortality rate forecasts than the original mortality models with a fixed fitting period. This supports the model-fitting strategy of averaging mortality rate forecasts from multiple starting points for improving out-of-sample forecast performance. The results also show that the impact of selecting the historical period for fitting extrapolative mortality models can be greater than the choice of the mortality models that we considered.



AFRIC



UNSW
SYDNEY

Servaas van Bilsen: Optimal Savings and Portfolio Choice with Risky Labour Income and Reference-Dependent Preferences

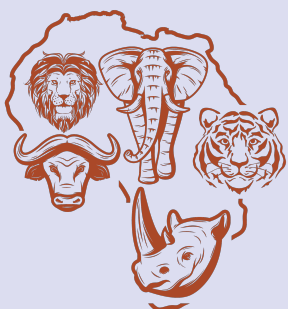
Abstract

This paper explores the joint impact of reference-dependent preferences and risky labour income on optimal savings and portfolio decisions. We develop a non-trivial solution procedure to determine the optimal policies. Our results reveal that the impact of permanent labour income shocks on both the optimal savings rate and the optimal portfolio share is more pronounced under reference-dependent preferences than under CRRA preferences. We find that in case of significant labour income shocks, individuals withdraw financial wealth already before retirement. Furthermore, we show that the optimal response of the savings rate and the portfolio share to a fall in labour income exhibits large heterogeneity across the ratio of consumption to the reference level. Finally, we find that the optimal investment strategy is more conservative compared to the case with risk-less labour income and CRRA preferences.

Shewangu Dzomira: A Philosophical Enquiry on Cybercrime Risk and Financial Institutions Exposure

Abstract

Cybercrime risk happens because financial institutions are frequently impotent to guarantee a fitting set of tools, skills, technologies, training, and best practices to safeguard networks, devices, programs, and data from unauthorized access. In the financial sector, the cybercrime menace has transformed the prototype of banking processes over numerous epochs since it upsets banking utilities and inflict substantial quantifiable losses. Consequently, financial institutions have been progressively revealing to cyber security threats owing to the extensive espousal of online operations and services provision. Cybercriminals have always targeted large-scale breaches, frauds, and heists on the financial institutions. To that end, the financial institutions have been swelling their technology overheads tirelessly to fight mounting cyber threats that gallop up their operating costs. Reports have shown that financial institutions' technology expenses (as the percentage of gross revenue) keep rising and is claimed to be the top among all sectors of the global economy. Hence, it submits that the global financial sector is unfavourably wedged by losses from the cybersecurity breaches and supplementary cyber overhead costs. The market remarks generally specify a severe consequence of cybersecurity gaps for the financial institutions. Financial sector experts have been trying to comprehend the causes of higher cyber breaches in the sector and sightseeing ways to resolve the concerns. Over the last several years, a body of literature on cybercriminal, cybersecurity and banking systems has been evolving grounded principally on the conceptual papers, survey studies, technical reports, policy documents, and newspaper articles. Conversely, some researchers lately made noteworthy efforts to understand more profoundly why and how cybercrime risk makes the universal financial sector disposed starved of appropriate risk guard



AFRIC



UNSW
SYDNEY

and management framework. Therefore, this study provides a philosophical enquiry of the growing body of literature discovering the issues related to prevalent effects of cybercriminal risk on the financial operations. As the cybercrime risk has looked like a major hazard to the financial zone, researchers, analysts, and experts are trying to understand this delinquent from diverse angles. There are numerous documents providing conceptual discussions, technical analysis, and survey results, but pragmatic studies founded on empirical data are still limited. Besides, the international and national regulatory bodies recommend guidelines to relief financial institutions manage cybercrime risk revelation. This paper fuse pertinent literature on cybercrime risk, concentrating on the scopes injurious to the financial institutions' exposure.

Stephane Loisel: Quickest Detection of Changes in Longevity Patterns

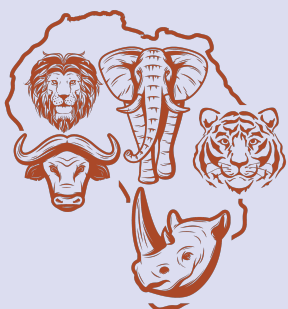
Abstract

In this talk, we tackle the problem of monitoring longevity patterns. We show that the so-called cusum strategy is the optimal one, when one considers a generalized Lorden criterion. We illustrate the method on simulated and real-world mortality datasets. This talk is based on several papers co-authored with Barigou, El Karoui, Laub and Salhi.

Titus Rotich: Microsimulation Modelling for Malaria Cost Estimations in Kenya

Abstract

Malaria is a serious ailment that can be life-threatening if not expediently attended to. It has remained a significant global health burden over the past few decades. In Kenya, it has remained one of the leading causes of morbidity and mortality despite significant efforts that have been made to provide access to malaria treatment. Here, we apply microsimulation modelling techniques to estimate the age-specific cost of malaria in Kenya. This involves modelling malaria cost at an individual level, enabling us to retrieve and utilize person specific information which would have otherwise been concealed in the aggregates. Incorporation of a resistance model enabled us to evaluate a vaccination program. An analysis of the individual pathways indicates that: 2 in 5 hope their sickness will self-resolve and don't seek medical attention, 3 in 10 with symptoms but without malaria are given antimalarial medication, while 1 in 10 who test positive for malaria don't get treated because of antimalarial shortage. Cost estimation show that the average cost of treating an initial episode of malaria is \$3.47, but this increases to \$19.39 if it progresses to severe malaria due to lack of prompt treatment. This is over 450% treatment cost increase. Finally, we used years of potential life lost (YPLL) to estimate the burden of malaria, and consequently used this quantity to quantify the impact of vaccination. We established that the cost of eliminating the stock-outs in all



AFRIC



UNSW
SYDNEY

dispensaries and clinics is \$1.2m, which lead to a decrease in YPLL from 32.67 to 21.64 per death, while an equivalent amount invested in the vaccination program would lead to YPLL of 25.23 per death. Therefore, a campaign on the importance of pathological tests, as well as adherence to the regimen will not only significantly reduce the antimalarial medicine budget, but also slow down the rate of antimalarial resistance growth. This will speed up the achievement of goal 3.3 of the 2030 agenda for sustainable development, which aims to end malaria endemic by 2030.

Tolulope Fadina: Optimal Reinsurance Under Model Uncertainty

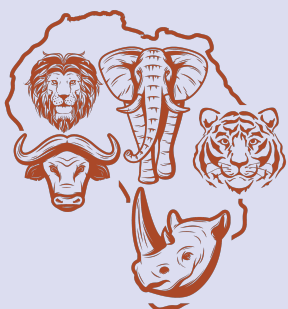
Abstract

We study the optimal reinsurance design from the perspective of an insurer with multiple lines of business, where the reinsurance is purchased by the insurer for each line of business respectively. For the risk vector generated by the multiple lines of business, we suppose that the marginal distributions are fixed, but the dependence structure between these risks is unknown. Due to the unknown dependence structure, the optimal strategy is investigated for the worst-case scenario. We consider two types of risk measures: Value-at-Risk (VaR) and Range-Value-at-Risk and general premium principles satisfying certain conditions. To be more practical, the minimization of the total risk is conducted with both budget constraints and expected profit constraints. For the VaR-based model with only two risks, it turns out that the limited stop-loss reinsurance treaty is optimal for each line of business. For the model with more than two risks, we obtain two types of optimal reinsurance strategies if the marginals have convex or concave distributions on their tail parts by constraining the ceded loss functions to be convex or concave.

Xavier Milhaud: Two-Sample Contamination Model Test

Abstract

In this paper, we consider two-component mixture models having one single known component. This type of model is of particular interest when a known random phenomenon is contaminated by an unknown random effect. We propose in this setup to test the equality in distribution of the unknown random sources involved in two separate samples generated from such a model. For this purpose, we introduce the so-called IBM (Inversion-Best Matching) approach resulting in a tuning-free relaxed semiparametric Cramér-von Mises type two-sample test requiring minimal assumptions about the unknown distributions. The accomplishment of our work lies in the fact that we establish, under some natural and interpretable mutual-identifiability conditions specific to the two-sample case, a functional central limit theorem about the proportion parameters along with the unknown cumulative distribution functions of the model. An intensive numerical study is carried out from a large range of simulation setups to illustrate the asymptotic properties of our test. Finally, our testing



AFRIC



UNSW
SYDNEY

procedure, implemented in the admix R package, is applied to a real-life situation through pairwise post COVID-19 mortality excess profile testing across a panel of European countries.

Yang Miao: Analysing Retirement Preparedness: A Study of a Canadian Investment Data Set

Abstract

Having a financially sound retirement plan is crucial to a person's overall financial wellness. It is of great research interest to assess whether a population is well prepared for their retirement. To this end, we obtain an investment data set from a registered Canadian investment provider. We analyse the financial instruments of the clients, as well as their investment behaviours. After building models for both components, the investor's wealth at retirement is projected, which is then compared with the commonly used retirement savings goals. Finally, we compare the results with the existing literature and comment on the retirement preparedness of the client cohort.

Yawei Wang: A Unified Markov Chain Monte Carlo Framework for Valuation and Assessment of Retirement Income Products

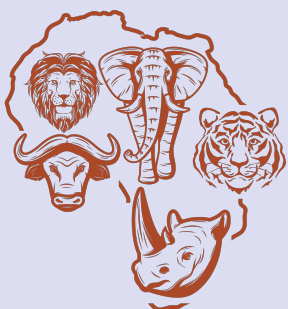
Abstract

This paper devises a flexible assessment framework of a catalogue of existing retirement income products which include, account-based pension, variable annuities, and group self-annuities. It utilizes the Hamiltonian Monte Carlo approach; a proven computational technique for simulating conditional distributions without prior knowledge of the normalizing constant and quickly converges to the target distribution in high dimensions. A graphic illustration for assessing the risk-return trade-offs for each product is presented which can readily be adapted by advisors, and all stakeholders as a tool for enhancing the decision-making process for retirees. This research addresses key recommendations from Australia's retirement income covenant which mandates trustees of superannuation funds in developing strategies aimed at i) maximizing expected retirement income, ii) managing longevity, investment, and inflation risks, and iii) enhancing flexibility in accessing member funds over the retirement period.

Yoboua Angoua: Determinants of Insurance Uptake in Sub-Saharan Developing Countries: Evidence from Cote d'Ivoire

Abstract

There have been several studies on the determinants of insurance consumption in developing countries and particularly in sub-Saharan African countries. Most of them focus on insurance consumption in rural areas and reach the conclusion that financial illiteracy and lack of liquidity constrain insurance consumption in rural area and mostly farmers. Given the proven growing African middle class, educated and with growing revenue, we focus in this study on the middle class



AFRIC



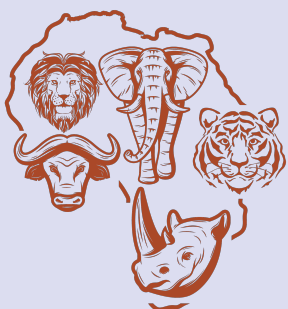
UNSW
SYDNEY

with the aim to identify the determinants of insurance consumption. Using data from Harmonized Survey on Households Living Standards 2018-2019 in Cote d'Ivoire, the study identified that, the main determinants are the marital status, the literacy, the Socio-professional category and the employer, the revenue, the living area, and the holding of another insurance. Furthermore, we highlight the under-consumption paradox of some type of insurance (life and household) given the identified determinant which need further analysis.

Yves-Cédric Bauwelinckx: On the Causality-Preservation Capabilities of Generative Modelling

Abstract

Modeling lies at the core of both the financial and the insurance industry, not only for pricing and provisioning, but also for determining capital requirements and liability management, as well as for fraud detection and more generally also in a context of market predictions. These modeling activities impact many parts of the global economy and contribute to the health of our financial systems. The rise and development of machine learning and deep learning models have created many opportunities to improve our modeling toolbox and increase our capacity to grasp complex phenomena. Breakthroughs in these fields have, however, often come with the requirement of large amounts of data. Such large datasets are often not publicly available in finance and insurance, mainly due to privacy and ethics concerns, restraining institutions from sharing data with researchers, other companies, or even between their own departments. This lack of data is currently one of the main hurdles in developing better models that can contribute to society and the economy. One possible option to alleviating this issue is generative modeling. Generative models are capable of simulating fake but realistic-looking data, also referred to as synthetic data, that can be shared more freely. While generative modeling is nothing new, a breakthrough was achieved in 2014 with the introduction of Generative Adversarial Networks (GANs). This method increased our capacity to fit very high-dimensional distributions of data. While research on GANs is an active topic in fields like computer vision, they have found limited adoption within the human sciences, like economics and insurance. A reason for this is that in these sciences, most questions are inherently about identification of causal effects, while to this day neural networks, which are at the center of the GAN framework, focus mostly on high-dimensional correlations. In this paper we study the causal preservation capabilities of GANs and whether the produced synthetic data can reliably be used to answer causal questions. This is done by performing causal analyses on the synthetic data, produced by a GAN, with increasingly more lenient assumptions. We consider the cross-sectional case, the time series case, and the case with a complete structural model. We find that in the cross-sectional scenario the GAN preserves causality, but for more advanced analyses challenges arise.



AFRIC

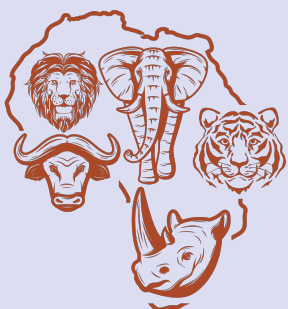


UNSW
SYDNEY

Zabibu Afazali: Dependence Modelling in Non-Life Insurance Using Local Gaussian Correlations

Abstract

Accurate estimation of risk and capital margins is major concern in insurance risk management and hence if ignored it can make it difficult for the company to identify diversification benefits and/or lack of it for risk calculations. According to Avanzi et al (2016), the dependence between claim amounts for different lines of business is crucial for capital efficiency. Non-linearity and tail dependence are common problems with financial and insurance data. It has been noted in Diers et al(2012) and Sancetta et al (2004) that the Bernstein Copula(BC) has the same drawbacks as other nonparametric estimators (i.e. the bias-variance trade-off) and cannot model asymptotic tail dependence. Therefore, we present the Local Gaussian Correlation (LGC) as an alternative approach to modeling dependencies between 7 LoBs in general insurance claims. By using the LGC, we can visualize dependence before we decide on the copula's input. We can test if dependence is equal or not equal between LoBs.



AFRIC



UNSW
SYDNEY

SECTION MEMBERSHIP 2023



OUR MISSION

To facilitate the international exchange of knowledge between individual actuaries on specific topics and become the go-to forum for actuarial knowledge, professional development, and networking in the actuarial profession.



WHY JOIN



20+
WEBINARS
annually

CPD OPPORTUNITIES



PODCAST SERIES

Visit www.actuaries.org and join!



- Model Risk Management – The Quest for a Unifying Approach by Andrew Smith
- The Insurance Risk Landscape: An Eclectic Survey by Michael Powers



ANNUAL SECTION COLLOQUIA



RESEARCH/WORKING GROUPS



**FREE
ACCESS TO**
 **actuvew**

First international streaming platform
specially designed for actuaries.

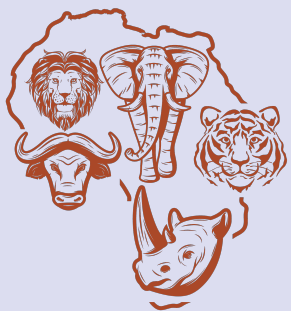
**WHAT'S
COMING**

JoCo 2024

2024 JOINT COLLOQUIUM



**JOIN
TODAY!**



AFRIC



**UNSW
SYDNEY**