

Abstracts of recent postgraduate theses and dissertations at South African universities

Assessing the financial viability of the Road Accident Benefit Scheme

By C Marais for MCom (Actuarial Science) at University of Cape Town, 2019

An assessment is made of whether the combination of fixed benefits, relaxed claim eligibility criteria and a simpler claim administration process, as proposed in the Road Accident Benefit Scheme Bill of 2014, can be expected to lead to a solvent form of compulsory motor-vehicle insurance in South Africa. Based on the supposition that the Road Accident Benefit Scheme (RABS) replaced the Road Accident Fund (RAF) on 1 April 2014 to operate as a no-fault system of compensation, it is estimated that the RABS will not be financially viable. However, the financial position of the RABS as at 31 March 2017 is estimated to be significantly healthier than that of the RAF, although this estimate is subject to material uncertainty.

Network structure, indirect losses and financial contagion in inhomogeneous, stochastic interbank networks

By NM Walters for PhD (Actuarial Science) at the University of Pretoria, 2019

We introduce new tiered bank network structures, allowing for many different bank sizes, and compare risk propagation in these structures with the well-known Erdős–Rényi, assortative and dis-assortative structures. The simulations indicate that in the presence of market sentiment and liquidity effects, the details of the structures in combination with the distribution of assets and the system's interconnectedness and size are crucially important in determining the risk of major capital loss in the network. In fact, even networks with similar levels of tiering can behave markedly different depending on these factors. In the absence of market sentiment and liquidity effects, the differences between the network structures is smaller. This highlights the importance of paying attention to network structure in conjunction with network characteristics, market sentiment and liquidity effects. This implies that policy actions aimed at influencing a network's characteristics must consider all aspects unique to that particular system and cannot follow a 'one-size-fits-all' approach. The framework is illustrated with an application using South African bank balance sheet data. Spikes in simulated assessments of systemic risk agree closely with spikes in documented subjective assessments of this risk. This indicates that network models can be useful for monitoring systemic risk levels.

In a large network setting, the study then considers the fraction of nodes that default in stochastic, inhomogeneous financial networks following an initial shock to the system. Results for deterministic sequences of networks are generalised to stochastic networks to account for interbank lending relationships that change frequently. A general class of inhomogeneous stochastic networks is proposed for use in systemic risk research, and we illustrate how results that hold for Erdős–Rényi networks can be generalised to the proposed network class. The network structure of a system is determined by interbank lending behaviour which may vary according to the relative sizes of the banks. We then use the results to illustrate how network structure influences the systemic risk inherent in large banking systems.

Fraud detection using operational risk modelling with incomplete data

By KC Muzerengwa for MSc (Actuarial Science) at the University of Pretoria, 2019

Systems and processes may fail and employees can engage in fraudulent activities that can go unnoticed for a very long time and the resulting losses can be very high and catastrophic to an institution. Setting a minimum threshold or a level of completeness will not guarantee that all losses above this point will be reported. In order to model operational risk data, a method that does not depend on the level of completeness is suggested. This can be done by introducing a detection probability that is combined with the underlying loss distribution to give a 3-parameter gamma distribution and fitted to a simulated dataset. It is found that the methodology is able to accurately estimate parameters when the data is incomplete.

The use of public objectives to design and monitor financial regulation:

An international assessment

By RD Rusconi for MSc (Actuarial Science) at the University of Pretoria, 2019

This study explores the extent to which and manner in which the regulators of financial markets design systems of financial regulation and monitor the success of these systems with reference to publicly-stated regulatory objectives. It describes the financial systems of eight countries and the frameworks used to regulate entities providing products and services in these systems. For each country assessed, it also investigates the extent to which regulators and supervisors appear to follow the priorities established by a defined set of regulatory objectives and the corresponding extent to which progress against these objectives is measured and reported.

An analysis of the determinants of sovereign credit ratings

By YC Yang for MSc (Actuarial Science) at the University of Pretoria, 2019

The study aims to quantitatively assess the extent to which sovereign ratings could be explained by a set of economic variables. A wide variety of factors could potentially bias a credit rating agency's decision. The analysis begins with replicating the results found in a seminal analysis by Cantor and Packer (1996). This analysis expanded by including more countries, dynamic over time and time lags. Multiple complementary statistical models and a Random Forest model are explored in this study. To ensure robustness of the model, out-sample-testing is applied. The results show that GNI per capita, GDP growth, total debt to

GDP, inflation rate, default amount, default indicator, HDI, change in HDI and IMF indicator are statistically significant. It is observed that current account to GDP, GDP growth and inflation rate have a time-lagged effect on sovereign ratings. A further analysis by separating between developing and developed countries using the IMF indicator suggests that there is a discrepancy between developing countries ratings and developed country ratings. The model results also support the existence of subjective decisions or adjustments in sovereign risk assessment.

An investigation of the effect of social solidarity reforms on the affordability of medical scheme cover for South African households

by D Shapiro for MSc (Actuarial Science) at the University of the Witwatersrand, 2019

Medical schemes operate based on social solidarity, which is established through community rating, open enrolment and Prescribed Minimum Benefits. However, social solidarity is limited by adverse selection, risk selection and limited income cross-subsidies among medical scheme members. Reforms consisting of a per-capita subsidy, risk equalisation and mandatory coverage have been proposed to increase social solidarity. This dissertation investigated the effects of these proposed reforms on the affordability of medical schemes for South African households. Publicly available data sources were used to investigate the household profiles of medical scheme beneficiaries, project contributions of medical scheme options under the reforms and assess the affordability of projected contributions for different household profiles. The dissertation found that medical scheme coverage is unaffordable for low-income members, especially pensioners. Coverage is affordable for members with higher incomes but affordability may depend on the option chosen and the threshold set for affordability. Affordability was found to not differ significantly for different household compositions. The current tax subsidy increases affordability for low-income members but not for members below the tax threshold. The replacement of the current tax subsidy with a per-capita subsidy would increase affordability for members below the tax threshold. Risk equalisation would introduce greater risk cross-subsidies between options but would decrease affordability for low-income households. Greater income cross-subsidies would thus need to accompany risk equalisation. Mandatory contributions related to incomes would introduce greater income cross-subsidies and make coverage affordable for low-income households. Increases in contributions would be relatively small for high-income households if coverage is mandatory only for taxpayers. Mandatory contributions for all income earners and for the full population would decrease affordability for members which may limit the extent to which mandatory coverage can be expanded. These results show that social solidarity reforms can increase the affordability.

