Knibbs lecture 2012

"The thrown coin: who gives a toss?
Adventures in the design of the golden die and in binary regression"

The annual Knibbs lecture was held on 27 November 2012 at ANU, with speaker Prof David Griffiths of the University of Wollongong, and discussants Dr Alice Richardson of the University of Canberra and Dr Michael Adena of Datalytics Pty Ltd.

It has become traditional at Knibbs lectures for the main speaker to give a short biographical summary of George Handley Knibbs, the first Commonwealth Statistician. However David, with some assistance from a grandson of Knibbs, gave a much more in-depth account of Knibbs' life and times. In addition to providing genealogical information on Knibbs, his parents, siblings and descendants, David had uncovered details of Knibbs early education, and career before he became the Statistician. He had been Professor of Physics and of Engineering and had lectured in other subjects, as well as being active in various professional societies and the like, and setting up the Rhodes Scholarships in Australia. He had also been an accomplished painter and been the subject of a short listed entry in the Archibald Prize.

Moving on to the topic of his talk, Binary Regression, he discussed the choice of link function, logit, probit and complementary log-log, and what covariates should be in the model.

David then discussed the probabilities of shapes landing on each face. When the aspect ratio is one, those probabilities are known. David then illustrated his talk with a number of wooden cuboid, but not cubic dice, throwing them to the amusement of the audience. For such dice the model of the probability of landing on a particular face is a binary analogue of a straight line through the origin. A cuboid needs to have an aspect ratio of about 2.65 for minimum prediction variance.

An application of the techniques of binary regression is in calculating the batting average of Don Bradman – 10 of his 80 innings were 'not out', giving a 'censored' problem. Applying different degrees of smoothing to the hazard function results in values of his batting average different to the usually quoted value of 99.96, and the conclusion that Bradman's average was greater than 100 if you wanted it to be.

Another application is to cost-benefit analysis of road infrastructure investment. A former student of David's, Sathish Redhi analysed data on fatal road accidents on roads around Wollongong. Considering factors such as severity of the crash, road type, curvature and driver factors such as alcohol, speed and fatigue, Sathish was able to show under which circumstances road upgrades would lead to lower accident rates and severities, the economic benefit of which outweighed the cost. On many road segments this was the case, and a copy of the thesis was sent to the RTA.

The first discussant was Dr Michael Adena – who couched his discussion in terms of the meta-analysis of randomised clinical trials, and of the appropriate link functions to use with particular problems. The complementary log-log link is useful for interval censored data, and for giving estimates of relative hazards. Another example is analysis of supply level data from the Pharmaceutical Benefits Scheme, in particular looking at the survival of patients starting beta-blockers.

Michael commended David for the way his talk had made complex issues seem simple.

The second discussant Dr Alice Richardson, posed the question whetherKnibbs would have given a toss, illustrating her argument with the experiment by Count de Buffon who estimated $\pi$by tossing needles onto lined paper. She then made the point that communicating the concepts of binary regression to the general public remains a problem. A problem familiar to the general public is the annual awarding of the Academy Awards (Oscars) – she discussed two papers that fitted models for the probability of awards. She discussed two other papers, on quantifying contributions of players in the National Basketball League, and the relationship between thinking and driving styles in young people.

In his response David mentioned other experiments which estimate π.

In questions the then recent phenomenon of Nate Silver and his predictions of the US election was mentioned. There was also discussion of talks by Percy Diaconis, who has shown that, given sufficient information, coin tossing is an entirely deterministic problem.