SFI Week 12 Revision

Tuesday, 11 April 2023 09:04

5 Topics

1. Risk models (Collective) Week 1-4
   - MGF $M_X(t) = E[e^{xt}] = \int e^{xt} f(\,)\, d$
   - Distributions PDF, CDF, mean, med, skewness
     - Poisson
     - Exponential
   - Estimate parameters MLE, Moments, percentiles
     Goodness of fit
   - Reinsurance mean, var, skew $\int$ $X, Y, Z = \begin{cases} 0 & X \le M \\ X-M & X \ge M \end{cases}$
     - Proportional Reins $X \begin{cases} R & Z \\ I & Y = M \end{cases}$
     - XOL Reins

     Slide 12 Week 2 $g(w)$
   - Tricks
   - Features of insurance Slide 27 - 33
   - Collective Risk models
     $S = \sum_{i=1}^{N} X_i$
     - $E(S) = E[E[S|N]]$
       $Var(S) = E[Var(S|N)] + Var[E(S|N)]$
     - Compound Poisson / Binomial distribution
       - E(S), Var(S) → $\lambda m_1, \lambda m_2 \cdots$
       - MGF $M_S(t) = M_N(\ln M_X(t))$
     - Reins + Compound distribution
       Examples
     - Hetero / Homo portfolio
       ↑ slide 25/37 Week 4 ↑ Slide 46
   - CW + Eg slides

2. Extreme Value Theory Week 5
   - Intro: (main idea) when to use, why we use it
     EVT ≠ Copula
   - GEV slide 6, 7 week 5
     ↑ $x_M = \max\{x_1, \cdots x_n\}$ block maxima
     CDF slide 8
     H(x)
     - Frechet
     - Weibull } slide 13 γ
     - Gumbel } eqs
   - GPD
     - $X-u \,|\, X>u$ $F_u(x)$ on slide 17
     - G(x)
   - Measures of tail weight
     4 ways
   - CW Questions + example on slides

3. Copula tail dependence Week 6
   - Intro ↑ ≥2 r.v.s

     Def Slide 10-11
   - Sklar's theorem - exit
   - Lower tail dependence / Upper tail dependence
   - Different types of copula
     a. Fundamental copulas
        a.1 Independence product
        a.2 Perfect positive co-monotic / min
        a.3 Perfect negative counter-monotic / max
     b. Explicit Copulas
        b.1 Archimedean copulas
            b.1.1 Gumbel
            b.1.2 Crayton
            b.1.3 Frank

        Eg. Slide 24 - 25 steps $\psi(0) = \infty$
     c. Implicit Copulas
        c.1 Gaussian
        c.2 Student's t

     Table slide 35 appropriately apply
   - CW + Eg Slides

4. Ruin Theory Week 8-9 $N \to N(t)$ $S \to S(t)$
   - Intro: model what? Notations
     $S(t) = \sum_{i=1}^{M(t)} X_i$
   - the Surplus process $U(t) = u + ct - S(t)$
     Story?
   - $\psi(\,)$ continuous / discrete
     t / Ultimate

     Slide 10, 12
   - Poisson process
   - Lundberg's inequality
     $\psi(u) \le e^{-Ru}$
     $c = (1+\theta)\lambda m_1$

     Slide 32 X
   - Eg Slide 33 - 39
   - Upper / Lower bound of R proof
   - parameters ↑, $\psi(\,)$? impact
   - CW + Eg slides

5. Run-off triangle
   - Dissions: Assumptions
     Critically evaluate
   - Calculation
     - ✓ Basic chain ladder why in this way weighted average
     - ✓ Inflation-adjusted Chain Ladder
       - ACPC ←
     - ✓ BF