Applied Statistical Modelling of the Insurance Claim Process: Incorporating Dependence Between Frequency and Severity

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The University

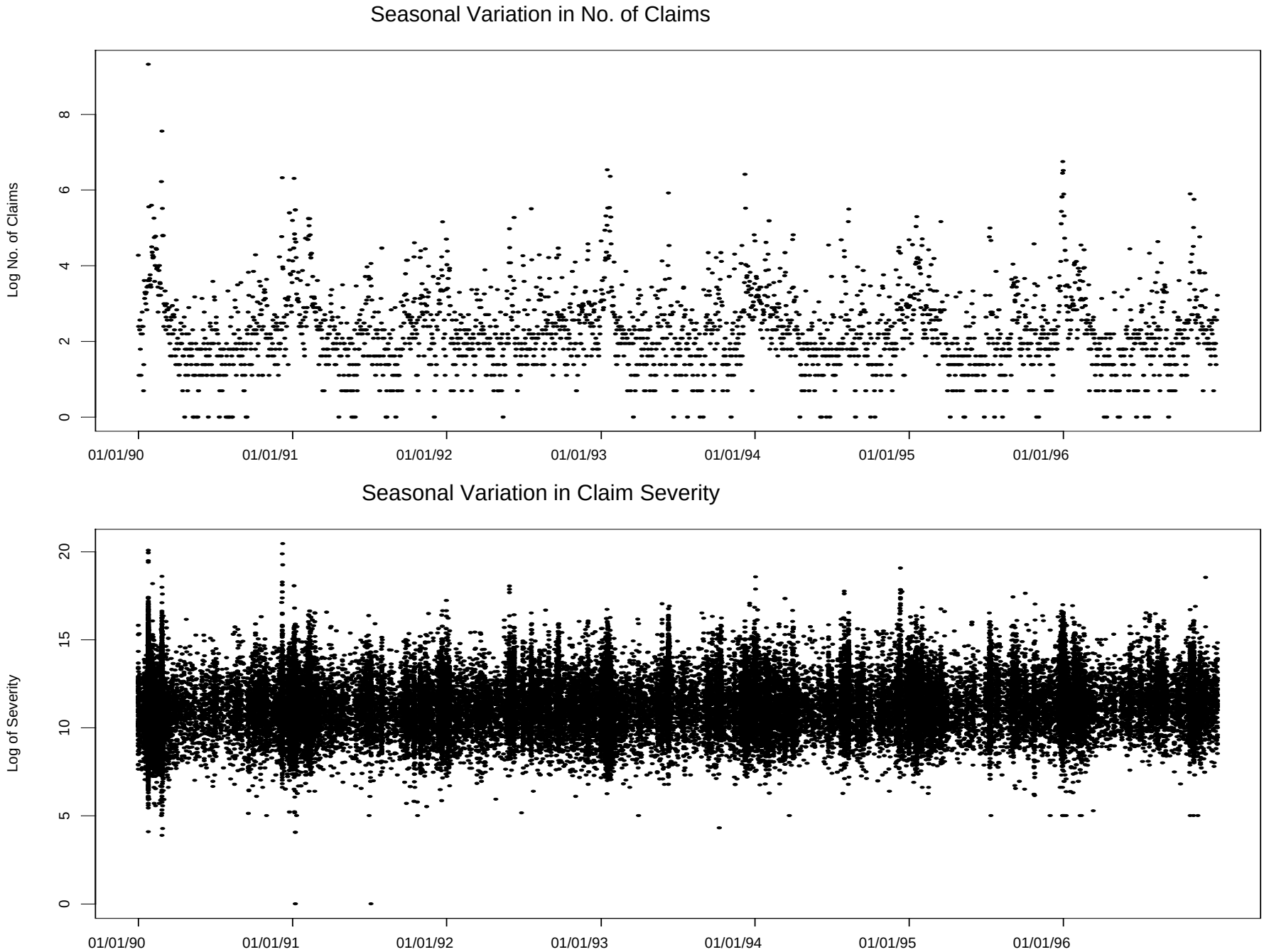
- One of the UK's leading professional, scientific and technological universities
- Almost 2/3 of income generated by own enterprise -- consultancy and Research Park
- "We are committed to the belief that establishing enterprising partnerships with industry... is the key to the fulfillment of our vision"
- Close to City

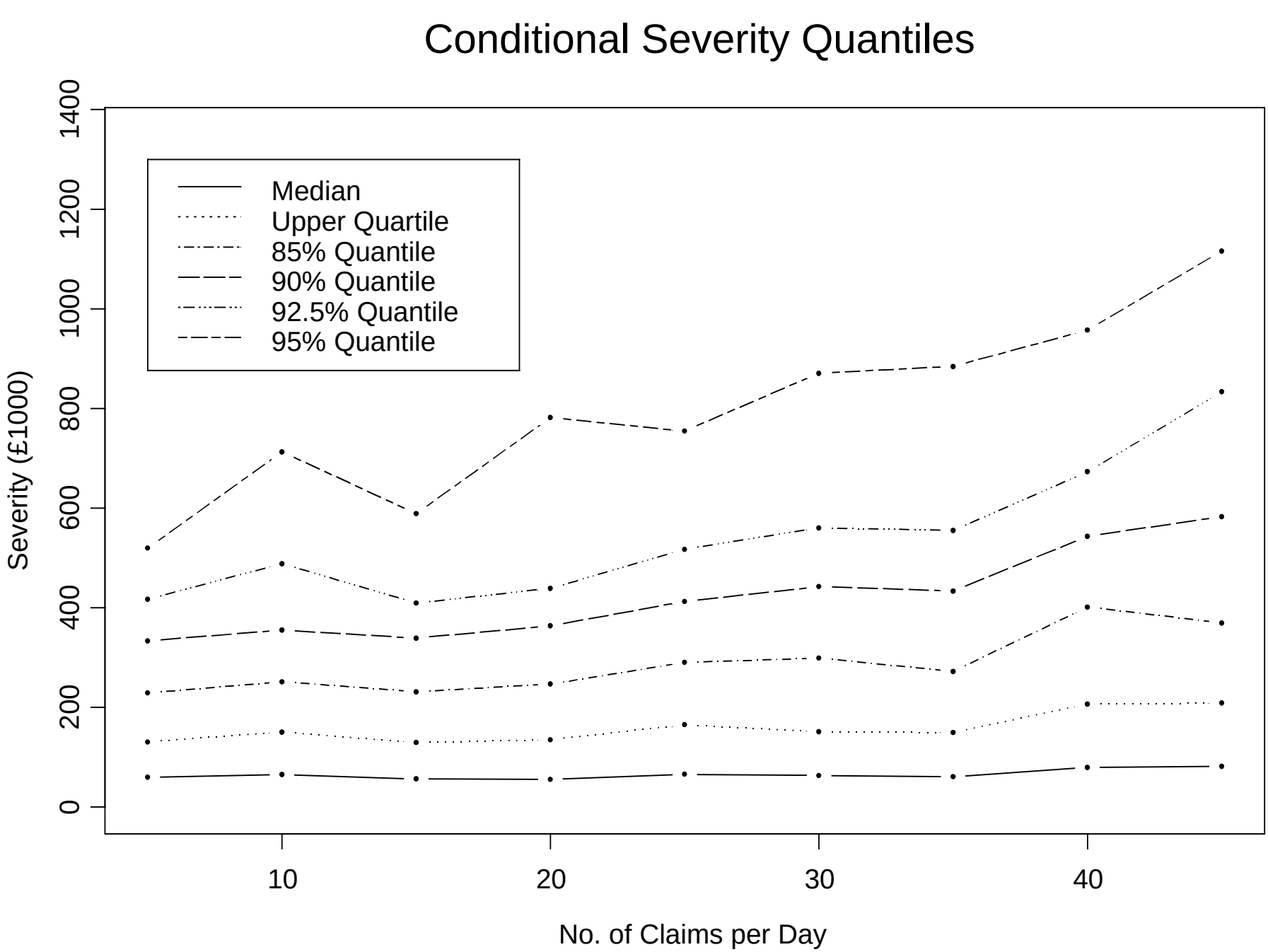
The Research Team

- Royal Statistical Society prize winners (AL, 1998; SB, 1999)
- Project involves combination of novel computational methods and extreme value techniques within the modelling framework
- “Dream team” consisting of an expert in each field and proven collaborative ability

Purpose of the Proposal

- Combine frequency and severity in a unified stochastic model
- Gain commercial advantage


Seasonal Variation in No. of Claims
Log No. of Claims
0
2
4
6
8
01/01/90
01/01/91
01/01/92
01/01/93
01/01/94
01/01/95
01/01/96
Seasonal Variation in Claim Severity
Log of Severity
0
5
10
15
20
01/01/90
01/01/91
01/01/92
01/01/93
01/01/94
01/01/95
01/01/96


Conditional Severity Quantiles
Median
Upper Quartile
85% Quantile
90% Quantile
92.5% Quantile
95% Quantile
Severity (£1000)
0
200
400
600
800
1000
1200
1400
10
20
30
40
No. of Claims per Day

Benefits

- A gain in efficiency
- Gaining advantage by exploiting effect depicted in graphs
- Improved assessment of risk: impact on premium setting and reinsurance

Proposed Approach

- Technology transfer: applying existing approaches to insurance problems
- “Development rather than research”
- Hierarchical graphical structure - “Lego Blocks”. A common language
- Flexibility and power
- Ability to answer relevant and realistically complex questions
- Model calibration via modern computational techniques. E.g. Gibbs sampling

Timetable (1 year)

- Identify and extend existing approaches
- Embed within applied statistical procedures
- Rigorously test and apply model to Tsunami data
- Examine other application areas, write up and submit

Deliverables

- Reports detailing model framework and assessing prediction performance
- Future predictions based on latest data
- Proposal for developing industry software
- Privileged disclosure to collaborator(s)

Extending the Work

- Naturally extensible modelling framework
- Missing data
- Covariates
- IBNR handled automatically
- Impact of changes in Law etc,…

Summary

- Powerful modelling technology already exists
- Realistically detailed modelling of claims process now practical
- Observable effects exploited for commercial advantage
- Linking pertinent questions from industry to relevant methods in academia