

A Longitudinal Study of Escalation in Crime Seriousness

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- Discussion of the three issues which need to be addressed in the study:
 - ① Measuring crime seriousness
 - ② Temporal scales in crime escalation
 - ③ Statistical method for analysis of escalation
- Results from linear mixed-effect modelling approach
- Conclusions

Definition

One way to study criminal careers is to study **escalation**. It is very important to understand how offenders develop their criminal careers from their first convictions.

- **Escalation** refers to the tendency to commit more **serious** offences as a career progresses. (Kyvsgaard, 2003)

Therefore, we do NOT consider **number** of convictions or number of arrests by year to assess escalation.

Various approaches to measurement

However, measuring the seriousness of a specific offence can be carried out by various means:

- 1 Views from the general population, or from criminal justice professionals.
- 2 Using official data on sentences, or using surveys of individuals.

We also need to be aware that the classification of seriousness of crime may change over decades (Francis, *et al.* 2001) and from country to country. For example, rape.

How we measure the seriousness of crime

A continuous score of seriousness, from **0 to 10**:

For each type of offence, according to the code and subcode defined by Home Office, a seriousness score has been computed using court sentencing data from England and Wales (Francis et al, 2005).

Table: Examples of the range of the seriousness score.

Type of crime	score
Murder	10.0
Rape of female 16+	8.1
Robbery	5.7
Shoplifting	3.6
Driving while disqualified	2.1
Selling food not complying with food safety	1.1

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Advantages of this measurement

Commonly, in escalation research, crimes are categorised into groups, and ranked in order of seriousness according to the view of the researcher.

Our method is an improvement as:

- 1 More sensitive to small changes (continuous rather than categorial measures),
- 2 Do not depend on broad category of crime,
For instance, **possession of a firearm with intent to cause fear of violence** (a violence offence) and **stealing from another person** (a property offence) are both given seriousness score **4.2**.

Temporal scales in crime escalation

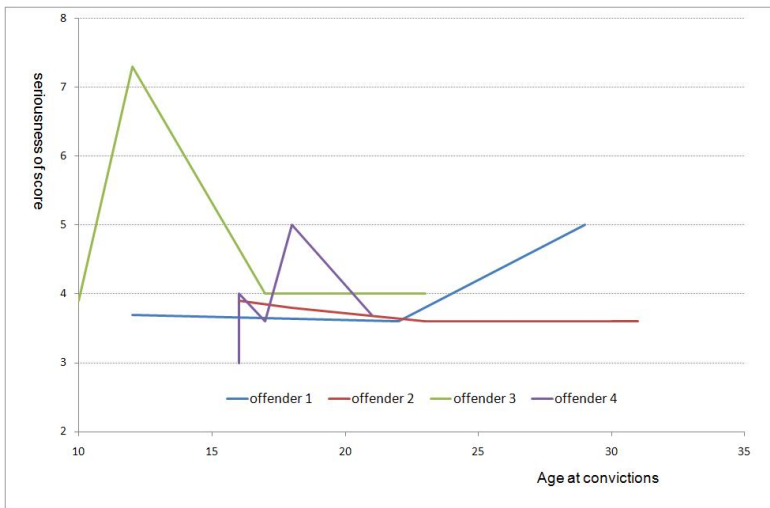
There are two ways of assessing change over time in the literature:

- 1 Change by conviction number (order of conviction)
- 2 Change over age

In this study, conviction number is used as the primary temporal scale, but the effect of age is examined as a time varying explanatory variable.

Temporal scales in crime escalation

By age at conviction



Linear mixed-effects models

Some papers have used traditional linear regression (e.g. Blumstein et al, 1988)

Traditional linear regression

$$Y_i = X_i\beta + \epsilon_i$$

Problems:

- Interpretation: Only marginal mean (population level) can be explained,
- Statistically: the errors (ϵ_i) are correlated within each offender over convictions.

Linear mixed-effects models

Longitudinal linear mixed-effects regression

$$\mathbf{Y}_i = \mathbf{X}_i\boldsymbol{\beta} + \mathbf{R}_i\mathbf{U}_i + \mathbf{W}_i(\mathbf{t}_i) + \mathbf{Z}_i$$

- $\boldsymbol{\beta}$ is the fixed effects at the population level, measuring a marginal mean.
- \mathbf{U}_i are random effects at the individual level, measuring the intercept and slope of the order of conviction effect.
- $\mathbf{W}_i(\mathbf{t}_i)^1$ is a serial correlation term, since measures of seriousness of convictions are very likely to associate within each offender.
- \mathbf{Z}_i is the residual error term.

Moreover, it allows correlation between intercept and slope.

¹ \mathbf{t}_i are conviction numbers.

Data

Offenders Index (OI), there are 4,396 offenders born in 1953-cohort followed from 1963 until 1999.

No. of convictions			Total offenders	
	Male	Female	Frequency	%
2 convictions	1,319	266	1,585	36%
3 convictions	669	87	756	17%
4 convictions	435	45	480	11%
5 convictions	302	21	323	7%
6 convictions	207	21	228	5%
7 convictions	188	12	200	5%
8+ convictions	788	36	824	19%
Total (%)	3,908 (89%)	488 (11%)	4,396	100%

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Linear mixed-effects models

Response variable, y_{ij} : Maximum seriousness score of offences at each conviction date.

Time varying covariates, x_{ij}

Order of conviction (slope): effects of experience

Age at conviction: effects of maturation

Number of offences at each conviction (logged)

Time-constant covariates, x_i

Gender

Age at onset

Linear mixed-effects models

Model selection

We fit models to all the data combined.

Models	1	2	3	4
	Fixed Effects			
Intercept	+	+	+	+
Order of conviction	+	+	+	+
Sex(female)	+	+	+	+
Age at conviction	+	+	-	-
Age at conviction with break point (18)	-	-	+	+
log(No. of offenses)	-	+	+	+
Age at onset	-	-	-	+
AIC	46321.64	45504.12	45436.27	45436.07
BIC	46386.11	45576.65	45516.86	45524.69
Likelihood-ratio test		M1 vs M2	M2 vs M3	M3 vs M4
P-value		< .0001	< .0001	0.1355

Therefore, we choose model 3.

Results

We also fit models to subsets of data (3,5,7) convictions.

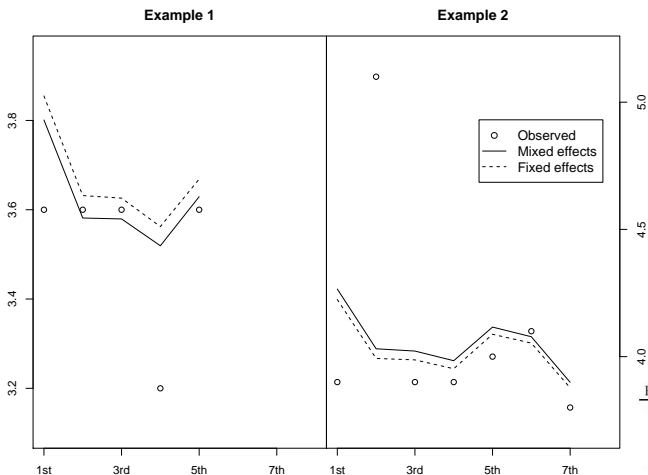
	3 Conv.		5 Conv.		7 Conv.		All Conv.	
	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E
Fixed Effects:								
Intercept	4.730	0.1619*	4.365	0.1782*	4.617	0.2211*	4.758	0.0545*
Order of conviction	0.018	0.0193	0.003	0.0130	0.030	0.0138*	0.009	0.0030*
Sex(female)	-0.166	0.0463*	-0.175	0.0590*	-0.236	0.0888*	-0.144	0.0185*
Age at conviction < 18	-0.048	0.0104*	-0.023	0.0115*	-0.040	0.0145*	-0.045	0.0034*
Age at conviction 18+	-0.009	0.0022*	-0.011	0.0022*	-0.014	0.0034*	-0.015	0.0007*
log(No. of offenses)	0.245	0.0332*	0.259	0.0320*	0.284	0.0422*	0.266	0.0091*
Random Effects :								
Intercept		0.565		0.335		0.296		0.233
Order of conviction		0.209		0.077		0.073		0.020
Residual		0.564		0.522		0.658		0.616

* indicates significance at the 5% level

Results are **consistent** across subsets of data, giving replication.

Goodness-of-fit

How well does the model fit at an individual's level?



Conclusions

- Age at conviction (**maturation**) and number of convictions (**experience**) are pulling in different directions. De-escalation with increasing maturation, escalation with increasing experience.
- Large number of convictions over a short period of time is more likely escalation.
- Long periods without a conviction, then maturation wins out over experience.
- For offender younger than age 18, with more than 5 convictions a year are likely to show escalation; for older than age 18, is with 2 or more convictions a year.
- No significant serial correlation within individuals.

References

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