10: Eksperimenter II

Videregående kvantitative metoder i studiet af politisk adfærd

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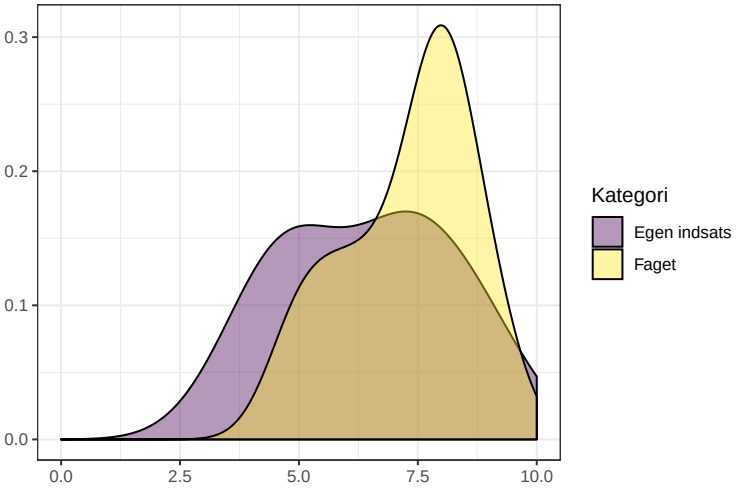
1. Formalia
   - Opsamling på halvvejsevaluering
2. Opsamling fra sidst
3. Usikkerhed i $\widehat{ATE}$
4. Clustering
5. Kovariater
   - Præ-treatment outcome
   - Andre kovariater
   - Blocking
6. Noncompliance
7. Case: Gerber & Green (2000)
8. Kig fremad

Overordnede evalueringer



Ros:

- emnevalg
- prioritering
- workshops
- præsentationer
- eksempler i R

Ris:

- fremrykning af specifikke kausale designs på bekostning af text as data
- kan godt gå hurtigere frem
- går lidt for hurtigt
- incentivering til at lave øvelser
- workshop v. instruktor

- potential outcomes framework
- randomisering i praksis: `sample()`, `set.seed()`
- forudsætninger eksperimentelle designs: excludability, noninterference
- $\rightarrow$ med randomisering, excludability og noninterference er den estimerede ATE i stikprøven = den sande ATE (in expectation!)
- case: GGL (2008)

Formlen for $\widehat{ATE}$'s standardfejl:

$$SE(\widehat{ATE}) = \sqrt{\frac{1}{N-1}\{\frac{mVar(Y_{i0})}{N-m} + \frac{(N-m)Var(Y_{i1})}{m} + 2Cov(Y_{i0}Y_{i1})\}} \quad (1)$$

- N enheder, heraf m allokeret til treatment
- Y_{i0} og Y_{i1} hhv. untreatede og treatede potentielle outcomes

Øvelse: design af turnout-eksperiment

En nyopstillet folketingskandidat for S i Egedalkredsen vil gerne implementere et eksperiment der tester effektiviteten af en flyer. Hvad kan DT gøre for at estimere effekten af flyeren mest muligt præcist? (Antag at man ikke kan treate alle, men frit kan vælge mellem forskellige vælgere i kredsen med forskellige karakteristika.)
Hvordan skal kandidaten udvælge individer?

$$SE(\widehat{ATE}) = \sqrt{\frac{1}{N-1}\{\frac{mVar(Y_{i0})}{N-m} + \frac{(N-m)Var(Y_{i1})}{m} + 2Cov(Y_{i0}Y_{i1})\}} \quad (2)$$

Kilder til mindre standardfejl:

1. $N \uparrow$
2. $Var(Y_{i0})$ og/eller $Var(Y_{i1}) \downarrow$
3. $Cov(Y_{i0}\, Y_{i1}) \downarrow$
4. m balanceret / allokeret til potential outcome med størst varians

I nogle situationer måles *outcome* individuelt, men *assignment* sker på cluster-niveau

- fx. mediemarkeder, kommuner, skoler
- grundlæggende implikation: ingen bias, men svækket præcision

$\widehat{ATE}$'s standardfejl med clustered treatment:

$$SE(\widehat{ATE}) = \sqrt{\frac{1}{k-1}\{\frac{mVar(\overline{Y}_{j0})}{N-m} + \frac{(N-m)Var(\overline{Y}_{j1})}{m} + 2Cov(\overline{Y}_{j0}\overline{Y}_{j1})\}} \quad (3)$$

- k: antal clusters
- $\overline{Y}_{j0}$ og $\overline{Y}_{j1}$: gns. potentielle outcomes på clusterniveau

Øvelse: design af turnout-eksperiment med clustered treatment

Kandidaten fra før vil gerne prøve at hænge plakater op i lygtepælene foran kredsens skoler, så treatment er nu clustered. (Antag at man kan vælge mellem forskellige skoler i kredsen med forskellige størrelser og karakteristika.)
Hvordan skal kandidaten udvælge skoler?

$$SE(\widehat{ATE}) = \sqrt{\frac{1}{k-1}\{\frac{mVar(\overline{Y}_{j0})}{N-m} + \frac{(N-m)Var(\overline{Y}_{j1})}{m} + 2Cov(\overline{Y}_{j0}\overline{Y}_{j1})\}} \quad (4)$$

Særlig type kovariat: præ-treatment observationer af outcome

- outcome kan måles som *ændring* præ-post
- i st. for difference-in-means, *difference-in-differences* estimator (jf. holdtime 12)
- lad X_i være præ-treatment observation af Y_i; diff-in-diffs estimator mere efficient når

$$\frac{Cov(Y_{i0}, X_i)}{Var(X_i)} + \frac{Cov(Y_{i1}, X_i)}{Var(X_i)} > 1 \tag{5}$$

- m.a.o., stærkt øget præcision når præ-treatment observationer af outcome korrelerer m. potential outcomes

Regression af Y_i på d_i og kovariat X_i:

$$Y_i = Y_{i0}(1 - d_i) + Y_{i1}d_i = a + bd_i + cX_i + (u_i - cX_i) \qquad (6)$$

$\rightarrow$ prædiktive kovariater reducerer residualer $\rightarrow$ standardfejl for $\hat{b} \downarrow$

Men: øger også 'researcher degrees of freedom'

»This type of analysis introduces an element of discretion in terms of what results are reported. Perhaps unconsciously, the researcher may settle on a regression model that makes the estimated ATE look impressive or interesting, a decision rule that jeopardizes the unbiasedness of the estimator.« (105)

Table 1. Explaining support for socially protective policies with physiological reactions to threatening images. Results of ordinary least squares (OLS) regression with support for socially protective policies (possible range from 0 to 18), with higher numbers indicating attitudes more supportive of policies thought to protect the social unit regressed on five explanatory variables: gender (0 = male; 1 = female), age (in years), education (six categories ranging from "did not finish high school" to "college degree plus"), income (six categories ranging from an annual salary of less than $20,000 to an annual salary of more than $100,000), and changes in skin conductance level (SCL) occasioned by the viewing of threatening images. Descriptive statistics on the variables and further discussion of the regression techniques are available in the SOM. *P < 0.05, two-tailed *t* test.

Variable	Unstandardized coefficient (SE)	Standardized coefficient
SCL	92.2* (29.03)	0.377
Income	-0.395 (0.471)	-0.10
Education	-1.63* (0.465)	-0.42
Age	0.19 (0.10)	0.235
Gender	-2.34 (1.3)	-0.20
Constant	-353* (193)	
N	46	
Adj. R-square	0.37	

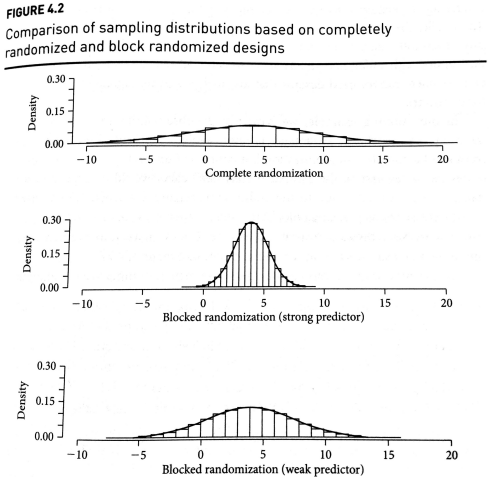
Table 2. Explaining support for socially protective policies with physiological reactions to nonthreatening images. Results of regression (OLS) with support for socially protective policies regressed on five explanatory variables.Variables are the same as those described for Table 1 except that skin conductance (SCL) is the change in skin conductance occasioned by the viewing of nonthreatening images. Descriptive statistics and further discussion of the regression techniques are available in the SOM. *P < 0.05, two-tailed *t* test.

Variable	Unstandardized coefficient (SE)	Standardized coefficient
SCL	-1.8 (35.08)	-0.007
Income	-0.438 (0.533)	-0.115
Education	-1.57* (0.53)	-0.408
Age	0.165 (0.11)	0.204
Gender	-2.23 (1.52)	-0.196
Constant	-304* (217)	
N	46	
Adj. R-square	0.21	

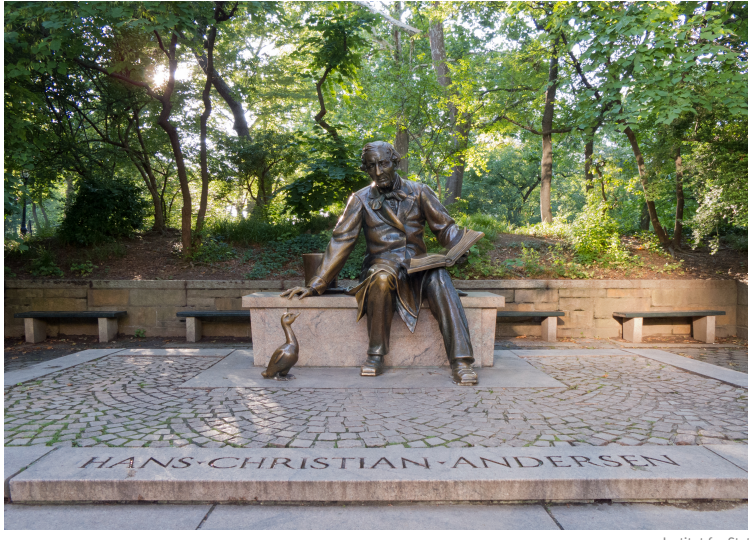
Blocking på kovariat *X* hjælper når:

- N er relativt lille
- X er ubalanceret
- X er stærk prædiktor for Y

God pakke til block random assignment:
`randomizr`



Eksempel på fordele ved blocking: HC Andersen-eksperimentet



Konceptuelt: to typer subjekter under ensidet noncompliance

- compliers: $d_i(z = 1) = 1$
- never-takers: $d_i(z = 1) = 0$

$\rightarrow$ tre grupper:

1. treatede compliers
2. non-treatede compliers
3. never-takers

For hvert subjekt i defineres:

$$ITT_{i,D} \equiv d_i(1) - d_i(0) \tag{7}$$

$$ITT_{i,Y} \equiv Y_i(1) - Y_i(0) \tag{8}$$

CACE er forholdet mellem $\overline{ITT_{i,Y}}$ og $\overline{ITT_{i,D}}$:

$$CACE = \frac{ITT}{ITT_D} \tag{9}$$

TABLE 5.1
Hypothetical schedule of potential outcomes assuming one-sided noncompliance

Observation	$Y_i(d=0)$	$Y_i(d=1)$	$d_i(z=0)$	$d_i(z=1)$	Type
1	4	6	0	1	Complier
2	2	8	0	0	Never-Taker
3	1	5	0	1	Complier
4	5	7	0	1	Complier
5	6	10	0	1	Complier
6	2	10	0	0	Never-Taker
7	6	9	0	1	Complier
8	2	5	0	1	Complier
9	5	9	0	0	Never-Taker

- ATE = (2+6+4+2+4+8+3+3+4)/9 = 4
- ITT = (2+0+4+2+4+0+3+3+0)/9 = 2
- CACE = (2+4+2+4+3+3)/6 = 3
- øvelse: hvad er ITT_D?

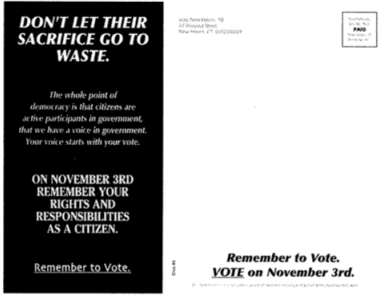
Direkte sammenligning af treatede og nontreatede v. noncompliance estimerer flg.:

$$CACE + \{E[Y_i(d=0)|D_i(1)=1] - E[Y_i(d=0)|D_i(1)=0]\}(1 - ITT_D) \quad (10)$$

$\rightarrow$ bias hvis compliers og never-takers har uens untreated potential outcomes

FIGURE 2. Picture Side

FIGURE 1. Text Side

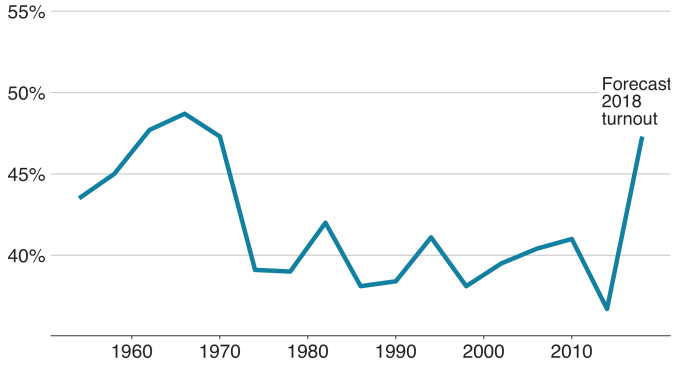


»to find the treatment effect, subtract the turnout rate of the control group from the turnout rate of the experimental group and divide this difference by the observed "contact rate,"which is 28%. Using this formula, we find that personal contact raises the probability of turnout by 8.7 percentage points« (658)

»Despite limitations, this experiment provides important new clues in the ongoing mystery of why turnout has declined even as the average age and education of the population has risen. A certain segment of the electorate tends not to vote unless encouraged to do so through face-to-face contact. As voter mobilization grows more impersonal, fewer people receive this kind of encouragement. This point is of great practical significance for those who seek to reverse the declining trend in turnout. Many of the recent policy innovations designed to encourage voter participation (e.g., absentee balloting) focus on reducing the costs of voting. Our findings suggest the importance of focusing as well on the personal connection between voters and the electoral process.« (662)

Highest turnout since 1970

Voter turnout for midterm elections, 1950-2018



Source: US Election Project. Voters as proportion of voting-eligible population BBC

Næste gang:

- instrumentvariable
- pensum: AP kap. 3
- fokus på afsnit 3.1 + 3.2
- case: Colantone & Stanig
  - emne: hvorfor Brexit?
  - fokus: afsnittet om 'Endogeneity'
- øvelser: se R-scriptet

Tak for i dag!