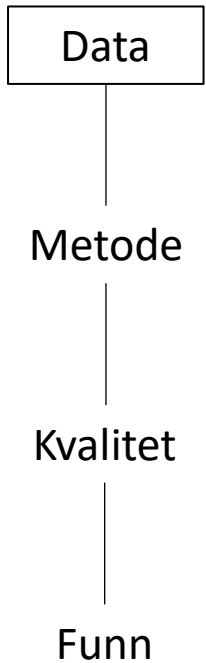




Data

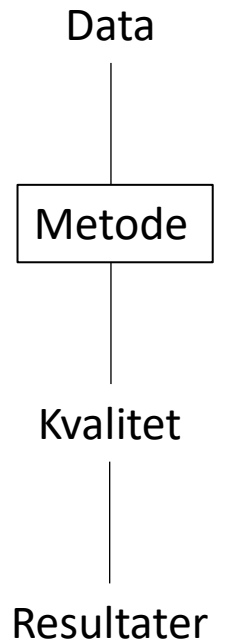
- Tidsserier fra 37 datasett, enkelte går tilbake til 1800-tallet
- Økonomisk, teknisk og demografisk data fra inn og utland
- Offentlig tilgjengelige kilder
- Autosys via SSB er hovedkilde til predikert variabel
- I underkant av hundre millioner prediktorer
- Oppdateres og transformeres med et tastetrykk





Metode

- Kjente tester, transformasjoner og feature selection metoder
- Shrinkage and selection operators
 - Iterasjon 1: Elastic Net
 - Iterasjon 2: LASSO
- Kryssvalideringsteknikker
 - Leave-one-out
 - Rolling Forecast
- Kvalitative vurderinger
 - Vurdering av gjeldende datasett opp i mot predikativ ytelse
 - Verifisering gjennom eksisterende forskning



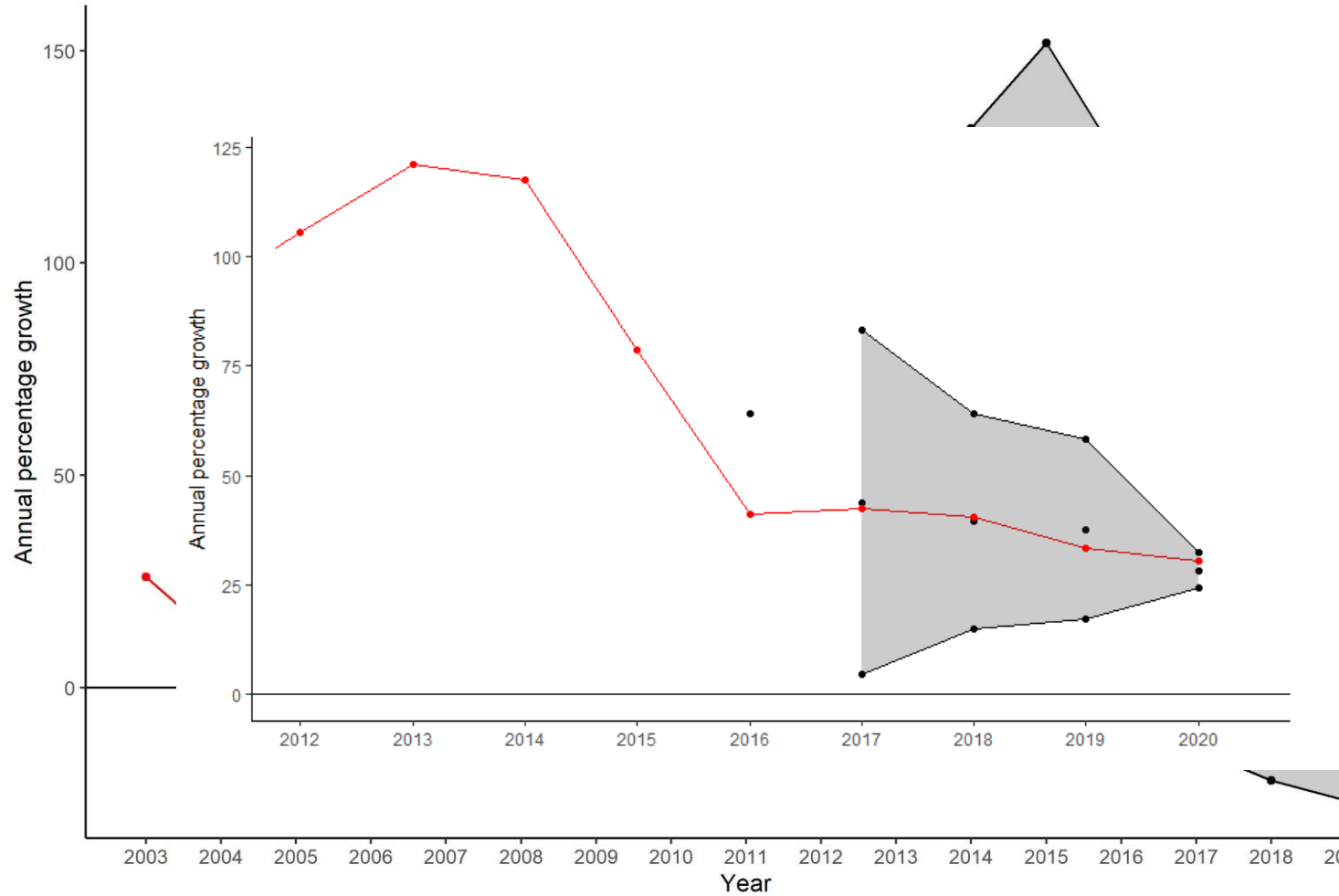
Kvalitet

Data

Metode

Kvalitet

Resultater



Model	CV MAE
2003-2009	0.051
2003-2010	0.042
2003-2011	0.084
2003-2012	0.102
2003-2013	0.110
2003-2014	0.123
2003-2015	0.116
2003-2016	0.108
2003-2017	0.096
2003-2018	0.112
2003-2019	0.111

Table 6: Cross validation results.

Measure	Optimal out of sample t=5	Optimal out of sample t=4
MSPE	0.0110	0.0006
RMSPE	0.1050	0.02545
MBPE	-0.0635	-0.0063
MAPE	0.0635	0.0221
SysErr	0.0919	0.0247
Correlation	0.69	0.90
Welch,p-value	0.45	0.88
Normal residuals		



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Resultater

Data

Metode

Kvalitet

Resultater

- Optimal modell: 264 variabler
- Tokningsmodell: 48 variabler
- Utvalgte sentrale fenomener
- Utdanning, effekt om 6 til 22 år
- Fødselsrater, effekt om 3 til 16 år
- Helsekostnader, effekt om 2-2 år
- Befolkningens kompetansenivå viktigst
- Få prediktorer man kan påvirke gjennom økonomisk politikk
- Mange fenomener er avledet fra befolkningens utdanningsnivå

Lag	Interaction term 1	Lag	Interaction term 2
14	Population, male, older adult, central	4	Immigration, southeast
14	Productivity, G7	4	Population
21	University educated, 3-4 years, central	6	Immigration, southeast
15	Population, male, children, southeast	7	Population, total, children, southeast
15	University educated, 5+ years, southeast	15	University educated, 5+ years, southeast
7	Population, total, youth, southeast	5	Population, female, retirees, southwest
6	Population, total, young adult, southwest	2	Productivity, EU
7	Population, total, children, north	1	Population, total, retirees, inland
3	Population, male, young adult, southeast	1	Population, male, retirees, southwest
-7	Population, male, children, inland	2	Immigration, southwest
5	Immigration, central	4	Population, female, young adult, southeast
-8	Population, male, young adult, southwest	1	Population, female, young adult, southeast
7	Population, male, children, inland	2	Immigration, north
-8	Population, male, young adult, southwest	8	Population, total, children, north
15	University educated, 5+ years, southeast	6	Immigration, southeast
7	Population, male, children, inland	2	Immigration, southwest
21	University educated, 3-4 years, southwest	4	Pop.All.N
15	University educated, 5+ years, southeast	6	Immigration, southeast
8	Population, male, young adult, southwest	1	Population, female, retirees, southwest
16	Population, female, retirees, southwest	1	Population, female, retirees, southwest
6	CPI, health	22	Primary school graduates, southwest
7	Population, total, children, north	1	Population, female, retirees, inland
7	GDP, developing economy	6	GDP, former east block, EU
5	Population, male, children, southeast	1	Population, male, children, inland

Table 4: Model, alpha 1 with coefficients

Beta	Net historic effect	Total historic effect
12.5 ++++	0.19 ++++	0.19 ****
35.8 ++++	0.12 ++++	0.12 ****
4.92 ++++	0.27 ++++	0.27 ****
-34.8 ----	0.03 ++++	0.05 ****
11.7 ++++	0.27 ++++	0.27 ****
6.49 ++++	0.037 ++++	0.038 ****
13.7 ++++	0.03 ++++	0.04 ****
-6.94 ----	0.031 ++++	0.035 ****
1.99 +++	0.02 +++	0.02 ***

Lag	Interaction term 1	Lag	Interaction term 2	Beta	Net historic effect	Total historic effect
14	Population, male, older adult, central	4	Immigration, southeast	12.5 ++++	0.19 ++++	0.19 ****
14	Productivity, G7	4	Population	35.8 ++++	0.12 ++++	0.12 ****
21	University educated, 3-4 years, central	6	Immigration, southeast	4.92 ++++	0.27 ++++	0.27 ****
15	Population, male, children, southeast	7	Population, total, children, southeast	-34.8 ----	0.03 ++++	0.05 ****
15	University educated, 5+ years, southeast	15	University educated, 5+ years, southeast	11.7 ++++	0.27 ++++	0.27 ****
7	Population, total, youth, southeast	5	Population, female, retirees, southwest	6.49 ++++	0.037 ++++	0.038 ****
6	Population, total, young adult, southwest	2	Productivity, EU	13.7 ++++	0.03 ++++	0.04 ****
7	Population, total, children, north	1	Population, total, retirees, inland	-6.94 ----	0.031 ++++	0.035 ****
3	Population, male, young adult, southeast	1	Population, male, retirees, southwest	1.99 +++	0.02 +++	0.02 ***
-7	Population, male, children, inland	2	Immigration, southwest			
5	Immigration, central	4	Population, female, young adult, southeast			
-8	Population, male, young adult, southwest	1	Population, female, young adult, southeast			
7	Population, male, children, inland	2	Immigration, north			
-8	Population, male, young adult, southwest	8	Population, total, children, north			
15	University educated, 5+ years, southeast	6	Immigration, southeast			
7	Population, male, children, inland	2	Immigration, southwest			
21	University educated, 3-4 years, southwest	4	Pop.All.N			
15	University educated, 5+ years, southeast	6	Immigration, southeast			
8	Population, male, young adult, southwest	1	Population, female, retirees, southwest			
16	Population, female, retirees, southwest	1	Population, female, retirees, southwest			
6	CPI, health	22	Primary school graduates, southwest			
7	Population, total, children, north	1	Population, female, retirees, inland			
7	GDP, developing economy	6	GDP, former east block, EU			
5	Population, male, children, southeast	1	Population, male, children, inland			

Table 4: Model, alpha 1 with coefficients from optimal model



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