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Models for Multi-Level Voting Behaviour

Exercises, Session 9 – Ecological inference using the latent structure approach

The terminology in this session gives a special meaning to X and Y. Now, these variables mean voting behavior at the individual level. We shall first consider binary choice, where the voter has the choice between two alternatives: voting socialist or non socialist. The individual choice at the first election is denoted X and the individual choice at the second election is denoted Y. With binary choice, X and Y can only take one of the two values 1 and 0. $X = 1$ for voting socialist and $X = 0$ for voting non socialist at the first election. $Y = 1$ for voting socialist and $Y = 0$ for voting non socialist at the second election.

The advantage of this terminology is that the mean value of X across individuals within district no. g, called $\overline{X}_g$, is equal to the proportion of voters within the district, voting socialist at the first election. And $\overline{Y}_g$ is the proportion of voters within the district, voting socialist at the second election. Omitting the index g the notation for voting behavior in a 2×2 table appear in Table 9.1.

Table 9.1 Proportions of grand total in a district

	Second election		
First el.	Socialist	Non socialist	Total
Socialist	p_{11}	p_{12}	$\overline{X}$
Non soc.	p_{21}	p_{22}	1- $\overline{X}$
Total	$\overline{Y}$	1-$\overline{Y}$	1

The difference between this table and the Table 8.1 in the previous session is that the voting transitions are recorded symmetrically as proportions of the grand total of all voters in the district, while the transitions in Table 8.1 was conditioned by voting behavior at the first election (i.e., rows summing up to 1). But of course it is also possible to compute the conditional voting behavior from Table 9.1 by dividing the cells in the first row with $\overline{X}$ and by dividing the cells in the second row with 1- $\overline{X}$.

Estimating 2×2 tables

The Pearson correlation is not an appropriate measure for the individual-level correlation in a 2×2 table, since X and Y are not normal distributed interval-scale variables. And further, the Pearson correlation between X and Y is dependent on the marginals of Table 9.1 i.e., $\overline{X}$ and $\overline{Y}$. More appropriate is the Gamma correlation coefficient γ , that is not dependent on $\overline{X}$ and $\overline{Y}$. For 2×2 tables the definition of the Gamma correlation is

$$\gamma = \frac{p_{11}p_{22} - p_{12}p_{21}}{p_{11}p_{22} + p_{12}p_{21}} \text{ . [show the derivation]} \tag{9.1}$$

According to Thomsen (1987, p.63) the individual-level Gamma correlation is under certain homogeneity conditions approximately equal to the ecological-level Pearson logit correlation

$$r = \frac{\sum (x_g - \bar{x})(y_g - \bar{y})}{\sqrt{\sum (x_g - \bar{x})^2 (y_g - \bar{y})^2}} \tag{9.2}$$

where x_g and y_g have the same meaning as in the previous sessions i.e., the logit support in district g at the first and at the second election.[1] The model for making ecological inference from the ecological to the individual level is simply

$$\gamma = r \, . \tag{9.3}$$

This equality is controversial, since the conventional wisdom is that it is an "ecological fallacy" to equate the ecological-level correlation with the individual level correlation (Robinson, 1950). However, the important difference to eq. (9.3) is that the ecological fallacy concerns equating the individual-level Pearson correlation between X and Y, not the Gamma correlation, and the ecological-level Pearson correlation between $\bar{X}$ and $\bar{Y}$, not the ecological logit correlation.

The homogeneity conditions for the validity of eq. (9.3) are

1. Functional homogeneity (which require analysis within separate political homogenous regions) i.e., the same individual level model should apply to all voters

2. Isomorphism between the factor structure on the individual level and the factor structure at the ecological level (which require ecological data that can reflect major social division, for example differences between middle-class neighborhoods and working-class neighborhoods in larger cities; in practice: sufficiently small units)

3. High ratio between individual-level and ecological-level variance in latent variables (usual no big problem, but the units should not be too small)

4. Each response alternative should be homogenous. (This is usually not the case – even in two party systems the third category of abstention should be included in any dichotomy. For this reason 2×2 tables usually are not satisfactory – one should estimate $m \times n$ tables).

Inserting eq. (9.3) into eq. (9.1) and isolating p_{11} on the left side yields

[1] Stricly speaking the equality holds between the tetrachoric correlation and the Pearson correlation between probit transformed shares, but the Gamma correlation is computational easier and has turned out to be a useful proxy to the tetrachoric correlation. Further, the logit transformation is also computational easier and a very close approximation to the probit transformation apart from a constant scale factor.

$$p_{11} = \frac{1 + r(2\bar{X} + 2\bar{Y} - 1) - \sqrt{[1 + r(2\bar{X} + 2\bar{Y} - 1)]^2 - 8r(1+r)\bar{X}\bar{Y}}}{4r}. \tag{9.4}$$

The rest of Table 9.1 is computed by

$$\begin{aligned} p_{12} &= \bar{X} - p_{11} \\ p_{21} &= \bar{Y} - p_{11} \\ p_{22} &= 1 - \bar{X} - \bar{Y} + p_{11} \end{aligned} \tag{9.5}$$

In the **ecol** program tables like Table 9.1 are estimated for each district and then aggregated for the whole region.

Preparing the data for estimating 2×2 tables

Using **ecol** we will estimate the same individual-level covariation as was estimated using the regression method in Session 8. This was transitions from 1998 to 2001 between the crude dichotomies of socialist parties versus non socialist parties, and the socialist/non socialist vote within the working class and the middle class. We compute these dichotomies in the do-file DKdis04.do by the commands in Table 9.2 both as absolute numbers (to be used in ecol) and as percentages and logit shares (to be used by the regression method and in illustrative graphs).

Table 9.2 Commands for computing crude dichotomies

```
* Voting dichotomies

* Absolute numbers and pct voting for socialist parties
egen validvot98 = rsum(dpoe98 - xdp98)
gen soc98 = dpoe98+dpf98+dpa98
gen nso98 = validvot98 - soc98
gen psoc98 = soc98/validvot98*100

egen validvot01 = rsum(dpoe01 - xdp01)
gen soc01 = dpoe01+dpf01+dpa01
gen nso01 = validvot01 - soc01
gen psoc01 = soc01/validvot01*100

* Pct non socialist voters
gen pnso98 = 100 - psoc98
gen pnso01 = 100 - psoc01

* Logits
gen lsoc98 = ln(psoc98/(100-psoc98))
gen lsoc01 = ln(psoc01/(100-psoc01))

* Class dichotomies

* Pct working class voters 1999
gen wrk99 = oclwc99+ocwrk99+ocupl99
gen mid99 = votep99-ocret99-wrk99
gen pwrk99 = wrk99/(wrk99+mid99)*100
```

```
* pct middle class voters 1999
gen pmid99 = 100 - pwrk99

* Logit
gen lwrk = ln(pwrk99/(100-pwrk99))
```

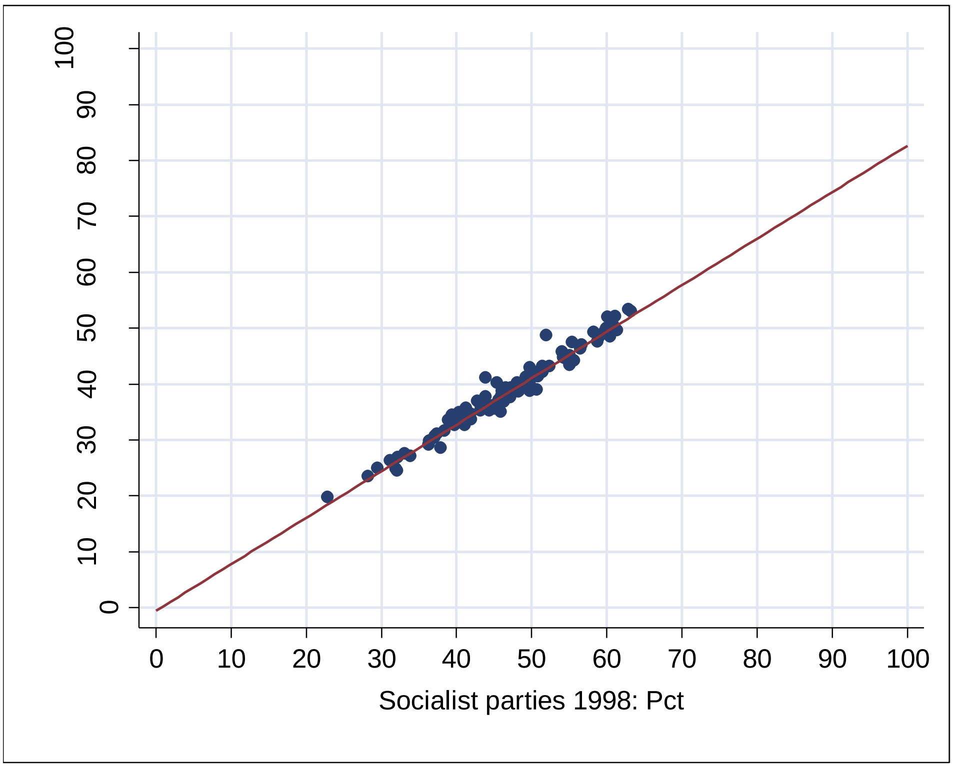
Notice that we are again using the rsum() function to add the votes for all parties (excluding non voters) to find the number of valid votes, while setting missing values equal to 0. This is for example done in the command

```
egen validvot98 = rsum(dpoe98 - xdp98)
```

Expected aggregate relations

To see the difference in the expected aggregate relations using either the regression method or the latent structure method (ecol), we first (again) show in Figure 9.1 the linear relation expected with the regression method.

Figure 9.1 (Figure 8.1, repeated) Regression line for estimating voter transitions from 1998 to 2001

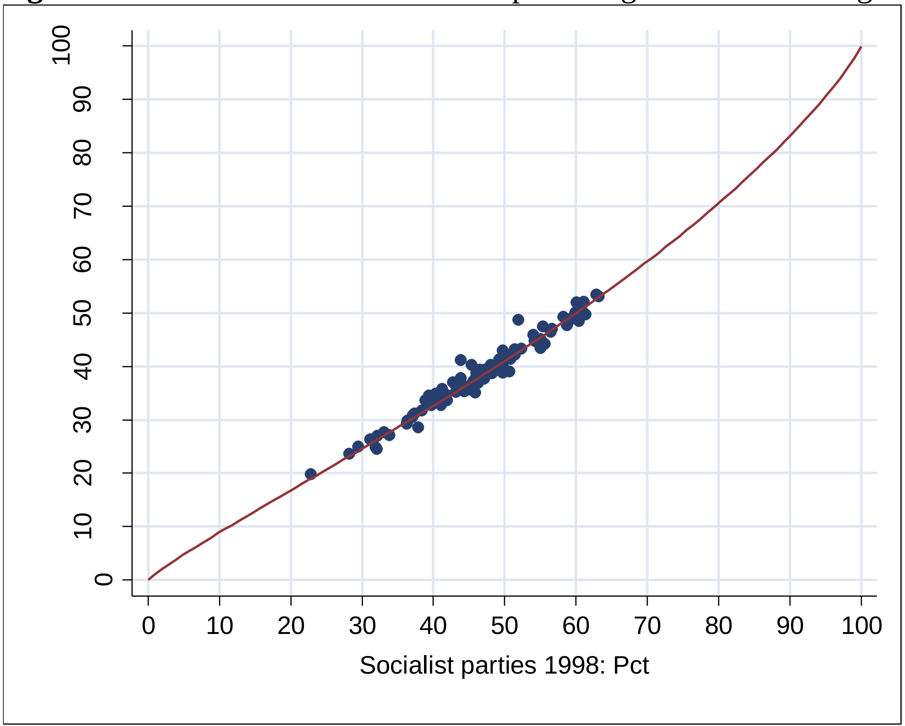


To find the expected relation with the latent structure method we assume as previously in this course that the logit shares are linear related. However, when this linear logit relation is shown in a percentage diagram such as Figure 9.1 the linear logit relation becomes non-linear. To show that in a graph we first estimate the linear relation between logits and then transform the expected relation back to percentages. The commands for this procedure are shown in Table 9.3 and the graph in Figure 9.2.

Table 9.3 Commands for finding the non-linear relation between percentages in the linear logit model

```
* Preparing errors-in-variables regression

* find correlation
correlate lsoc98 lsoc01 [aweight=validvot01 ]

* Errors-in-variables regression analysis weighted by unit size
eivreg lsoc01 lsoc98 [aweight=validvot01], reliab(lsoc98 `r(rho)')

* Get coefficients
matrix coefs = e(b)
gen a = coefs[1,2]
gen b = coefs[1,1]
gen pct = (_n-0.99)/(_N-0.98)*100
gen logit = ln(pct/(100-pct))
gen tendency = a + b*logit
replace tendency = exp(tendency)/(1+exp(tendency))*100

* Draw symmetric scattergram
twoway (scatter psoc01 psoc98, sort) (line tendency pct, sort clpat(solid)),/*
*/ ytitle(Socialist parties 2001: Pct, margin(medsmall)) yscale(range(0 100))/*
*/ xtitle(Socialist parties 1998: Pct, margin(medsmall)) xscale(range(0 100))/*
*/ xlabel(0(10) 100, grid) legend(off) ysize(4) xsize(5)/*
*/ ylabel(0(10) 100, grid) legend(off)/*
*/graphregion(fcolor(white) lcolor(black))
```

Figure 9.2 Non-linear relation between percentages in the linear logit model



Notice that we are using errors-in-variables regression to find the linear relation between logits as we did in Session 7. This is because of the latent structure model which assumes a random component at both elections in contrast to the simple regression approach. Notice also that we compute the pct variable a little bit different to avoid percentages equal to 0 or 100 (for which logits are not defined).

Comparing Figure 9.1 with Figure 9.2 we see that although the expected relation between the percentages in the linear logit model is curvilinear in the whole range from 0 to 100 pct. it is almost straight linear within the empirical range. This might justify the use of a simple linear percentage model instead of the linear logit model. However, we notice an ever-so-slightly curving of the scatter of data points that could justify the linear logit model. However, this is not the central point. The central point is that we are assuming a very different individual-level process behind the data structure with the latent structure approach than with the regression approach. With the regression approach we just assume that the conditional proportions p and q are constant across districts. In contrast, with the latent structure approach we assume huge individual variation between individuals with a non-linear model that add up to a similar non-linear model at the aggregate level. This leads to different individual-level estimates with the latent structure model than with the regression model. For example, it is a property of the latent structure model that the expected relation in Figure 9.2 always connects to the origin of the coordinate system (0, 0). In the regression method for ecological inference this usually means that one estimate very few transitions from non-socialists to socialist, while it has a different consequence for the estimation with the latent structure method.

Using the ecol program

The latent structure method (also called the logit method) is now implemented as a Stata command ecol that uses both an ado-file and a plogin compiled from C++ code to increase speed. In case you wish to install ecol in your PC all you need is explained and freely available from the Internet address **http://www.mit.ps.au.dk/Stata**. ecol can only be run on a 32-bit version of STATA, so if you have a 64-bit version of STATA, you should also add the 32-bit STATA version which you can add from your installation CD (without removing the 64-bit version!). We suggest that you keep a shortcut on your desktop to both the 32-bit version (Stata.exe) and the 64-bit version (Stata-64.exe) and use the 32-bit version when running ecol.

In case you want to estimate voter transitions between socialist and non-socialist parties from 1998 to 2001 without paying attention to political regions in Denmark you just write the command

```
ecol soc98 nso98/ soc01 nso01
```

where you write the variable names for the absolute number of votes in each row-category in the individual-level table before the slash (/) and the variable names for the absolute number of votes in each column category in the individual level table after the slash. If you do that you should get the following table 9.4.

Notice that all percentages are in share of the table total. In case you want to have row percentages instead you can make a permanent reconfiguration of ecol (until you leave Stata) by the command

```
ecol pct rows
```

You can see a lot of other options for ecol by the command

```
help ecol
```

or by consulting the manual (available from the mentioned web site).

Table 9.4 Ecol estimates of voter transitions in percent of total

```
Results for entire country (103 districts)

  Total %  | soc01 nso01 | Total
-----------+-------------+------
     soc98 | 36.35  9.81 | 46.17
     nso98 |  1.50 52.33 | 53.83
-----------+-------------+------
     Total | 37.85 62.15 |   100
```

After the reconfiguration of ecol you can run the original command again, and this time you get a table with row percentages, shown in Table 9.5

Table 9.4 Ecol estimates of voter transitions in row percentages

```
Results for entire country (103 districts)

   Row %   | soc01 nso01 | Total
-----------+-------------+------
     soc98 | 78.74 21.26 |   100
     nso98 |  2.79 97.21 |   100
-----------+-------------+------
     Total | 37.85 62.15 |   100
```

You can compare Table 9.4 with the results Table 8.5 obtained with the regression method and with survey results from the Danish Election Study, shown in Table 9.5.

Table 9.5 Survey results of voter transitions

1998\2001	Soc.	Non soc.	Total
Soc.	74	26	100
Non soc.	4	96	100
Total	39	61	100

The results with the latent structure method are usually less extreme than those obtained with the regression method and usually quite close to survey results. It should also be noticed that best ecological estimates usually are obtained with the parties singled out instead of grouped in broad categories as here. Further, better estimates are usually obtained by separate estimates within different homogenous political regions, for example identified with the cluster analysis technique presented in Session 7. Finally, the estimates are usually more valid when small districts like precincts are used. Regional estimates can easily be done in our example because a regional variable region is available. Instead of finding the command for estimating in separate regions you can use the dialog window available. It is opened by writing ecol and shown in Figure 9.3.

In this window you can enter the names of X-category (row category) variables, Y-category (column category) variables and the region variable (or pick them from the list of variable names in the Stata Variables window). You can also decide which category should be the base or reference category.[2] If you make the same choices as in Figure 9.3 you will get the results in Table 9.6. T he results are only shown for the whole country, but you can see the regional results by reconfiguring ecol (see help ecol).

[2] This is only of consequence if you have more than two categories in an individual-level variable, but then it can matter a lot. It is recommended that the reference category is a relatively large and neutral category such as abstention or retired persons. The dependence of choice of reference category can either be seen as a weakness or a possibility for calibrating the method by choosing the reference category that usually gives the best estimate.

Figure 9.3 Stata with the **ecol** dialog window opened

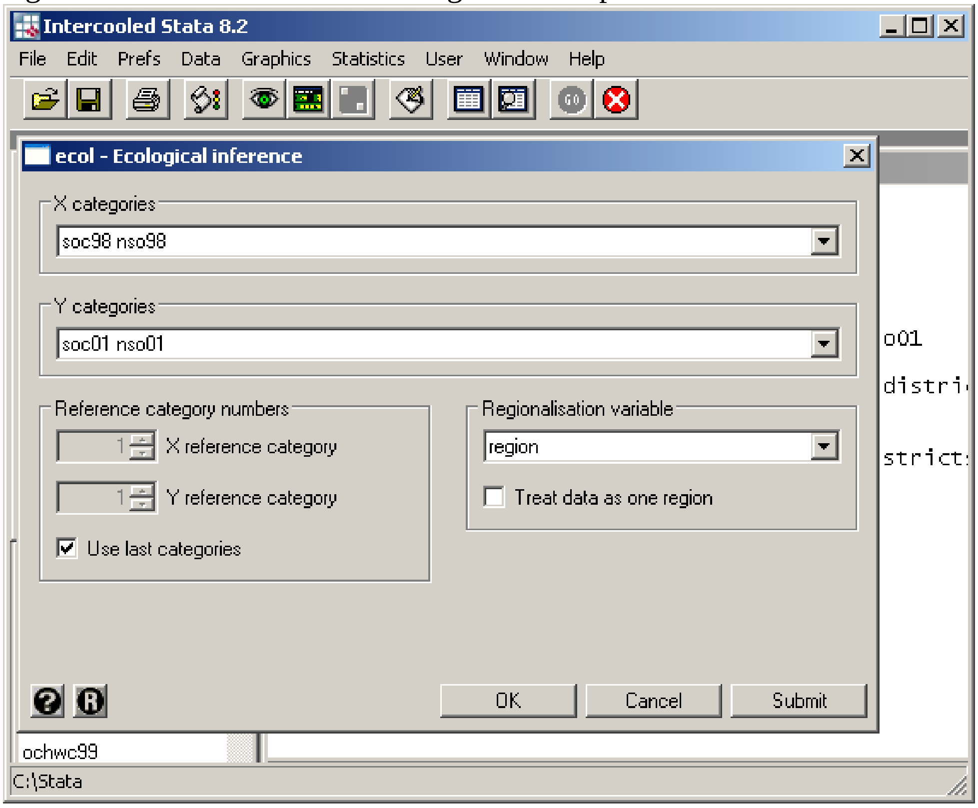


Table 9.6 Ecol estimates of voter transitions using a regional division

```
Results for entire country (8 regions, 103 districts)

   Row %    | soc01 nso01 | Total
-----------+------------+------
     soc98 | 77.63 22.37 |   100
     nso98 |  3.74 96.26 |   100
-----------+------------+------
     Total | 37.85 62.15 |   100
```

The results are actually quite close to the survey results even if the marginal distributions for 1998 are slightly biased in the survey results.[3] The Stata command generated by the dialog is

bysort region : ecol soc98 nso98 / soc01 nso01

In a similar way you can also estimate class vote in 1998 by the command

bysort region : ecol wrk99 mid99 / soc98 nso98

giving the results in Table 9.7. Comparable survey results from the Danish Election Study 1998 are shown in Table 9.8.

[3] Recall data from the Danish Election Study 2001. The survey data were weighted (in Master01.b) to fit with the actual election results in 2001, not necessarily with the 1998 results.

Table 9.7 Ecol estimates of class voting using a regional division

```
Results for entire country (8 regions, 103 districts)

   Row %    | soc98 nso98 | Total
-----------+------------+------
     wrk99 | 53.68 46.32 |   100
     mid99 | 36.80 63.20 |   100
-----------+------------+------
     Total | 46.18 53.82 |   100
```

Table 9.8 Survey results of class voting

	Soc.	Non soc.	Total
Working	55	45	100
Middle	39	61	100
Total	46	54	100

Also in this case the ecol estimates are quite close to the survey results, even if we are using crude dichotomies.

Estimating m×n tables

Table 9.9 shows the notation for voter transitions between more than two parties from one election to the next as proportion of the total number of voters.

Table 9.9 Notation for voter transitions as proportion of total in m×n table

Party no. at first election	Party no. at second election 1	2	. . .	k	. . .	n	Total
1	p_{11}	p_{12}	. . .	p_{1k}	. . .	p_{1n}	$\bar{X}_1$
2	p_{21}	p_{22}	. . .	p_{2k}	. . .	p_{2n}	$\bar{X}_2$
.	. . .	. . .	. . .	. . .	. . .	. . .	.
.	p_{j1}	p_{j2}	. . .	p_{jk}	. . .	p_{jn}	.
j	. . .	. . .	. . .	. . .	. . .	. . .	$\bar{X}_j$
.	p_{m1}	p_{m2}	. . .	p_{mk}	. . .	p_{mn}	.
.							.
m							$\bar{X}_m$
Total	$\bar{Y}_1$	$\bar{Y}_2$	. . .	$\bar{Y}_k$	. . .	$\bar{Y}_n$	1

p_{jk} is the proportion of all voters choosing both party no. j at the first election and party no. k at the second election. The cells in Table 9.9 are estimated by an iteration procedure that uses the equality (9.3) for 2×2 tables. The procedure considers simultaneous all the $(m\text{-}1)\times(n\text{-}1)$ 2×2 subtables that involves the last row and the last column (the reference or base category parties at the two elections). Thus, it considers all subtables like Table 9.10 for $j = 1, 2, \ldots,$ $m\text{-}1$ and $k = 1, 2, \ldots, n\text{-}1$.

Table 9.10 2×2 subtable of Table 9.9

	Second election		
First el.	*k*	*N*	Total
j	p_{jk}	p_{jn}	$p_{jk}+p_{jn}$
m	p_{mk}	p_{mn}	$p_{mk}+p_{mn}$
	$p_{jk}+p_{mk}$	$p_{jn}+p_{mn}$	$p_{jk}+p_{jn}+p_{mk}+p_{mn}$

The theoretical advantage of Table 9.3 is that it only involves those voters who choose either *j* or *m* at the first election and either *k* or *n* at the second election. This satisfies homogeneity condition no. 4 above i.e., the response alternatives are homogenous, since each alternative only involves a single party. So, in theory, we should be able to estimate p_{jk} from the Pearson correlation between the marginal logits

$$x_{jm|kn} = \ln\left(\frac{p_{jk}+p_{jn}}{p_{mk}+p_{mn}}\right) \tag{9.6}$$

and

$$y_{kn|jm} = \ln\left(\frac{p_{jk}+p_{mk}}{p_{jn}+p_{mn}}\right) \tag{9.7}$$

Unfortunately, we do not know the marginals of table 9.10. However, we can estimate them iteratively by gradually constructing all 2×2 subtables that satisfies the equality (9.3). As first estimates we estimate the "crude binary choice" as in table 9.11 between voting for a certain party *j* versus the rest of the parties (including abstaining) at the first election and voting for party *k* versus the rest of the parties at the second election.

Table 9.11 Crude binary choice

	Second election		
First el.	*k*	Other	Total
J	p_{jk}	$\bar{X}_j - p_{jk}$	$\bar{X}_j$
Other	$\bar{Y}_k - p_{jk}$	$1 - \bar{X}_j - \bar{Y}_k + p_{jk}$	$1 - \bar{X}_j$
Total	$\bar{Y}_k$	$1-\bar{Y}_k$	1

These first estimates are computed with the procedure for 2×2 tables presented above. These estimates are crude, since they are not in accordance with homogeneity condition no. 4, but they can be used as first estimates to construct the marginals in the $(m\text{-}1)\times(n\text{-}1)$ subtables like Table 9.10 in every district. This leads to second estimates of the transitions in Table 9.2 in every district that can be used as third estimates, etc. until the equality (9.3) is satisfied for all subtables. This method always gives admissible estimates.

This is how we estimate m×n tables. The week point about this method is that the final outcome is dependent on the choice of reference parties. Usually the estimates are quite close to survey results if one chooses large neutral categories such as abstainers or pensioners as reference "parties". Current efforts are directed towards development of a method that can estimate m×n tables without the arbitrary choice of reference parties.

Ecol estimates of multi-party voting

Multi-party voter transitions and multi-party class vote is estimate by **ecol** using the commands in Table 9.12. Remember to widen the Stata Results window to make room for the quite wide tables and to avoid line wrapping.

Table 9.12 Commands for estimating multi-party voter transitions and class vote

```
* Ecol method

* Multi-party voter transitions
bysort region : ecol dpoe98-absdp98 / dpoe01-absdp01

* Multi-party class voting
bysort region : ecol ocfar99-ocret99 / dpoe01-absdp01
```

The estimated voter transitions in Table 9.13 are all admissible and add up to the true marginals (they always do) and quite close to the survey results. It should be reflected that the individual cells in Table 9.14 with the survey results are not the final truth because some of them are based on very few observations. The ecol estimates seem to reproduce quite well the large number of stable voters (choosing the same alternative at both elections) and also the most important flows between the parties like the many voters that vent from the conservatives (dpc98) to the liberals (dpv01).

Also the estimates of class vote in Table 9.15 using ecol are quite close to the survey results in Table 9.16. The ecol estimates reproduce quite well the many farmers (ocfar99) voting for the liberal party (dpv01) and the many workers (ocwrk99) unemployed (ocupl99) and retired persons (ocret99) voting for the Social Democrats (dpa01).

Problems

Problem 1

Estimate crude party choice (socialist vs. non socialist) for the crude class membership (working class versus middle class) for 2001.

Problem 2

Show the the same 2x2 table as in Problem 1 for each of the 8 regions.
Hint, use: help ecol

Problem 3

Estimate multi-party class voting for 1998
Hint: remember to reconfigure ecol back, so that you do not see each region more.

Table 9.13 Ecological estimates of multi-party voter transitions in 8 regions (using ecol)

Results for entire country (8 regions, 103 districts)

Row %	dpoe0	dpf01	dpa01	dpb01	dpd01	dpq01	dpc01	dpv01	dpo01	dpz01	xdp01	spldp 01	absdp 01	Total
dpoe98	57.83	19.73	2.21	5.04	1.81	0.17	1.21	3.66	0.56	0.07	0.01	0.18	7.51	100
dpf98	5.23	63.36	4.45	7.29	1.05	0.16	4.37	2.21	2.00	0.09	0.01	0.44	9.34	100
dpu98	2.18	2.98	6.90	5.81	3.87	1.08	2.81	37.49	5.32	2.18	0.08	2.29	27.00	100
dpa98	0.43	1.06	73.29	0.64	0.31	0.19	1.97	2.08	9.75	0.32	0.02	0.52	9.41	100
dpb98	0.52	1.32	1.51	64.55	8.78	0.38	7.18	10.72	1.31	0.11	0.01	0.82	2.79	100
dpd98	0.31	1.86	1.41	12.46	15.62	2.61	22.05	34.72	3.63	0.13	0.01	0.36	4.83	100
dpq98	0.06	0.06	0.86	1.21	0.36	67.19	5.16	17.81	3.27	0.94	0.01	0.65	2.43	100
dpc98	0.28	1.61	1.51	7.27	1.35	0.47	55.22	20.83	6.20	0.17	0.01	0.36	4.71	100
dpv98	0.06	0.02	0.43	0.51	0.12	0.40	1.69	92.79	3.00	0.15	0.00	0.30	0.52	100
dpo98	0.06	0.64	8.82	0.99	0.45	0.76	3.44	13.02	65.17	0.59	0.02	1.58	4.44	100
dpz98	1.82	0.90	15.51	0.77	2.32	1.05	16.69	20.70	11.36	3.32	0.02	4.71	20.83	100
xdp98	2.40	3.78	4.48	3.57	2.19	0.57	6.72	11.52	10.85	0.51	0.04	2.55	50.84	100
spldp98	1.23	2.96	8.51	1.77	0.39	0.65	1.05	37.46	15.97	3.37	0.04	9.20	17.41	100
absdp98	1.02	2.12	7.26	2.27	1.67	1.09	4.40	13.48	10.03	1.22	0.10	2.00	53.32	100
Total	2.07	5.50	25.09	4.48	1.53	1.97	7.82	26.95	10.35	0.48	0.03	0.88	12.85	100

Table 9.14 Survey estimates of multi-party voter transitions (Danish Election Study 2001)

1998\2001	UnLst	SocPP	SocDem	SocLib	CenDem	ChrPP	Cons	Lib	DanPP	ProgP	Abst	Total
UnLst	72.7	8.8	11.5	4.2	0.0	2.9	0.0	0.0	0.0	0.0	0.0	100.0
SocPP	2.2	45.6	23.9	4.8	0.0	0.5	0.5	5.4	8.9	0.0	8.1	100.0
SocDem	0.4	3.4	62.4	1.5	0.7	0.7	3.1	11.1	8.2	0.2	8.3	100.0
SocLib	0.0	6.2	6.5	59.5	6.5	2.0	2.6	12.8	0.0	0.0	3.9	100.0
CenDem	0.0	4.5	7.7	13.8	21.2	3.6	21.0	28.2	0.0	0.0	0.0	100.0
ChrPP	0.0	0.0	2.3	0.0	4.1	65.0	11.1	17.4	0.0	0.0	0.0	100.0
Cons	0.5	0.5	1.6	0.4	0.8	1.3	59.3	23.7	6.6	0.8	4.5	100.0
Lib	0.1	0.2	1.7	1.6	1.2	0.6	4.5	77.4	6.2	0.3	6.3	100.0
DanPP	0.0	0.0	2.1	0.0	0.0	1.0	0.9	12.8	75.0	0.0	8.2	100.0
ProgP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.1	19.9	0.0	100.0
Abst	1.0	2.2	6.7	2.5	1.2	3.0	1.5	13.8	7.1	1.4	59.7	100.0
New	5.7	6.7	21.1	6.0	4.2	0.0	9.5	22.7	4.2	0.0	19.7	100.0
Total	2.1	5.5	25.1	4.5	1.5	2.0	7.8	27.0	10.4	0.5	13.8	100.0

Table 9.15 Ecological estimates of multi-party class voting in 8 regions (using ecol)

Results for entire country (8 regions, 103 districts)

Row %	dpoe0	dpf01	dpa01	dpb01	dpd01	dpq01	dpc01	dpv01	dpo01	dpz01	xdp01	spldp 01	absdp 01	Total
ocfar99	0.68	1.15	7.74	1.06	0.39	2.31	2.84	66.34	9.02	1.82	0.01	2.44	4.20	100
ocslf99	1.33	1.49	6.28	6.58	2.14	5.32	9.96	52.70	6.33	0.99	0.03	2.31	4.53	100
ochwc99	1.48	6.73	18.12	12.82	3.73	2.10	17.63	29.23	2.35	0.05	0.01	0.17	5.60	100
oclwc99	1.03	4.38	38.13	2.00	1.08	0.95	10.38	15.82	15.18	0.15	0.02	0.56	10.33	100
ocwrk99	0.88	3.30	22.06	1.07	0.41	2.72	2.74	38.81	19.51	0.62	0.03	1.06	6.79	100
ocupl99	9.17	8.86	32.80	1.87	1.10	0.84	5.33	5.41	7.50	0.52	0.04	0.92	25.65	100
ocstd99	6.75	15.07	21.86	12.68	3.29	0.83	10.02	11.89	2.44	0.06	0.02	0.23	14.86	100
ocret99	1.80	4.72	29.34	1.76	0.99	1.86	5.18	21.13	8.62	0.68	0.03	1.10	22.79	100
Total	2.07	5.50	25.09	4.48	1.53	1.97	7.82	26.95	10.35	0.48	0.03	0.88	12.85	100

Table 9.14 Survey estimates of multi-party class voting (Danish Election Study 2001)

Occup \ 2001	UnLst	SocPP	SocDem	SocLib	CenDem	ChrPP	Cons	Lib	DanPP	ProgP	Abst	Total
Farming	0.0	0.0	2.2	0.0	0.0	0.0	9.2	71.5	6.8	0.0	10.3	100.0
Selfemployed	2.4	2.0	11.4	6.8	1.3	3.3	16.7	45.8	8.7	1.6	0.0	100.0
Higher salaried	3.9	7.1	22.3	10.6	0.4	2.0	10.3	28.0	7.9	0.0	7.6	100.0
Lower salaried	2.5	8.6	26.5	5.7	1.8	1.5	8.0	28.7	6.8	0.6	9.5	100.0
Workers	0.7	3.6	25.8	1.5	2.0	1.9	4.6	22.9	14.8	0.3	22.0	100.0
Unemployed	2.0	2.6	26.0	2.7	0.0	0.0	0.0	15.8	15.0	0.0	36.0	100.0
Students	4.6	13.0	21.2	6.0	3.2	2.7	8.8	24.5	5.6	0.6	9.8	100.0
Retired	1.1	2.5	29.7	2.4	1.3	2.3	8.2	25.4	12.3	0.6	14.3	100.0
Total	2.1	5.5	25.1	4.5	1.5	2.0	7.8	27.0	10.4	0.5	13.8	100.0