Title

example 1b — Covariates for class membership

Description Remarks and examples Also see

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In this example, we demonstrate how to fit an FMM with covariates that model the probability of class membership.

Remarks and examples

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We continue with example 1a, where we settled on the three-component mixture model as being the best fit for these data. In that example, we used variables from our data to predict the mean of medical expenditures for each latent class. However, the prior probability of being in a given class was the same for each individual.

Assuming that the probabilities of belonging to a particular class are the same for all individuals does not seem realistic for these data. It seems more reasonable to think that individual characteristics predict the probability of being in a given group. We specify `totchr` in the `lcprob()` option to model the latent class probabilities based on the number of chronic conditions a person has.

```
. use http://www.stata-press.com/data/r15/mus03sub
(Abbreviated dataset mus03data from Cameron and Trivedi (2010))
. fmm 3, lcprob(totchr): regress lmedexp income c.age##c.age totchr i.sex
Fitting class model:
```

(iteration log omitted)

```
Finite mixture model                            Number of obs     =      2,955
Log likelihood = -4712.3871
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
1.Class	(base outcome)					
2.Class						
totchr	.9376084	.2222695	4.22	0.000	.5019683	1.373249
_cons	-.6114399	.4542569	-1.35	0.178	-1.501767	.2788872
3.Class						
totchr	1.16097	.2588803	4.48	0.000	.6535739	1.668366
_cons	-3.270603	.6134585	-5.33	0.000	-4.47296	-2.068246

```
Class          : 1
Response       : lmedexp
Model          : regress
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lmedexp						
income	.0048917	.0026337	1.86	0.063	-.0002702	.0100537
age	.0261976	.284515	0.09	0.927	-.5314416	.5838368
c.age#c.age	-.0000843	.0018944	-0.04	0.965	-.0037973	.0036286
totchr	.5412491	.1163553	4.65	0.000	.3131969	.7693012
sex						
female	.1793964	.1507783	1.19	0.234	-.1161237	.4749164
_cons	5.035174	10.61396	0.47	0.635	-15.76781	25.83815
var(e.lmed~p)	2.311098	.2100365			1.934015	2.761703

```
Class          : 2
Response       : lmedexp
Model          : regress
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lmedexp						
income	.0027131	.0013618	1.99	0.046	.0000439	.0053822
age	.2675077	.1152288	2.32	0.020	.0416634	.4933519
c.age#c.age	-.001688	.0007648	-2.21	0.027	-.0031869	-.0001891
totchr	.2878736	.0354297	8.13	0.000	.2184327	.3573145
sex						
female	-.1326158	.0602376	-2.20	0.028	-.2506795	-.0145522
_cons	-2.895759	4.313613	-0.67	0.502	-11.35029	5.558767
var(e.lmed~p)	.7413402	.0801554			.5997686	.9163288

```
Class          : 3
Response       : lmedexp
Model          : regress
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lmedexp						
income	-.0061289	.0041295	-1.48	0.138	-.0142226	.0019648
age	-.2012074	.2578283	-0.78	0.435	-.7065417	.3041268
c.age#c.age	.0011186	.0017078	0.65	0.512	-.0022287	.0044659
totchr	.106383	.0878267	1.21	0.226	-.0657542	.2785202
sex						
female	-.3027395	.1371042	-2.21	0.027	-.5714588	-.0340202
_cons	18.93315	9.651339	1.96	0.050	.0168759	37.84943
var(e.lmed~p)	.3241542	.1006027			.176432	.5955603

In the first table, we see that `totchr` is significant in both class probability equations. We use `estimates store` and then `estimates stats` to compare this model with the three-component one we fit in example 1a.

```
. estimates store fmm3f

. estimates stats fmm3 fmm3f

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
fmm3	2,955	.	-4727.674	23	9501.348	9639.147
fmm3f	2,955	.	-4712.387	25	9474.774	9624.555

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

Both the AIC and the BIC favor the model that uses a predictor to model class probabilities. We continue with this new model in example 1c, where we illustrate some postestimation features.

Also see

[FMM] **fmm intro** — Introduction to finite mixture models

[FMM] **fmm: regress** — Finite mixtures of linear regression models

[FMM] **estat lcmean** — Latent class marginal means

[FMM] **estat lcprob** — Latent class marginal probabilities