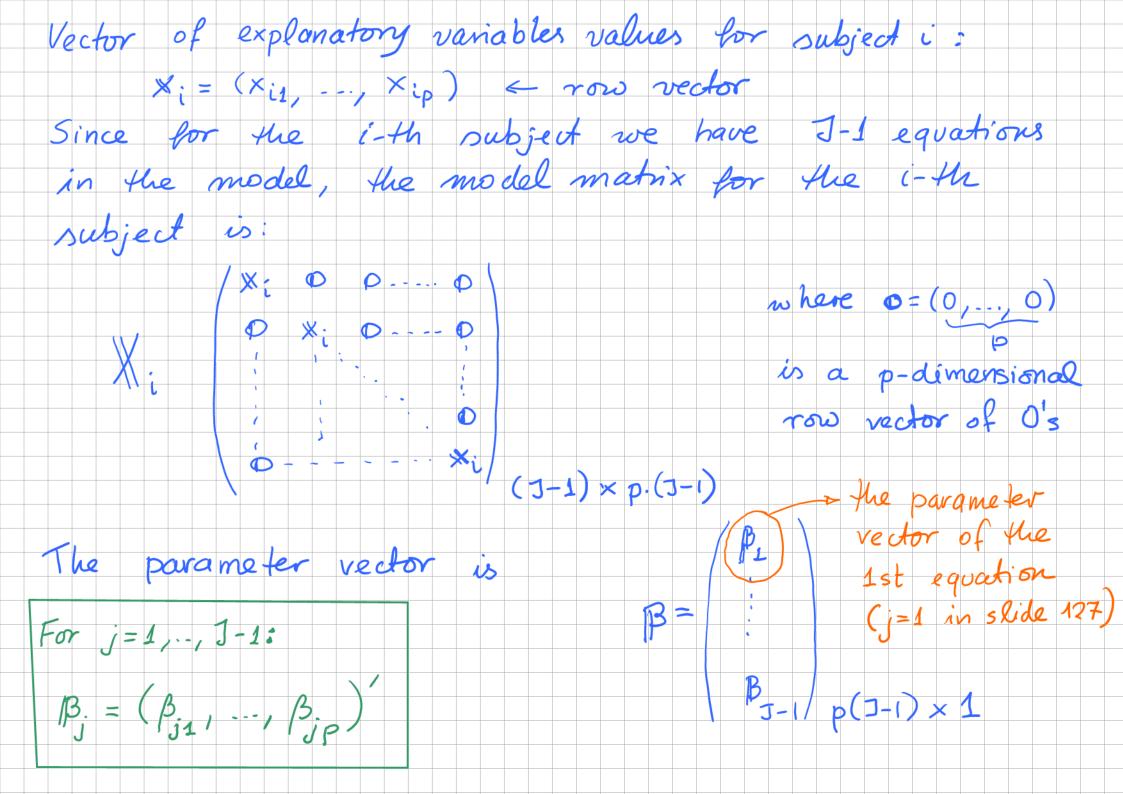
Matrix formulation of baseline calegory logit model Consider the i-th subject in the sample (i=1,--, n). The response vector is $Y_i = (Y_{i1}, \dots, Y_{i,j-1})$, since $y_{ij} = 1 - \sum_{j=1}^{n} y_{ij}$ (i.e., y_{ij} is redundant). In this case $\mu_i = E(Y_i) = (T_{i1}, \dots, T_{i,J-1})$ and the vector of commical link functions is g = (g1, -, g1-1) with $g_i(\mu_i) = log(\frac{\mu_{ij}}{\mu_{ij}}) = log$ Thus / Mis/ Mis g (Mi) = log / Miz/ Mis 4i, J-1/4iT/(J-2) × 2



Finally: $\log \left(\frac{\mu_{ij}}{1-\sum_{i=1}^{j-1}\mu_{ie}}\right)$ loo (Mi, 3-1/(1-24ie)/ × B - 0 0 1,3-1 (2) In univariate GLM5 with canonical link we had: $g(\mu_i) = \theta_i$ (s. Definition II.2.14) Remark: O and consequently hi are subject specific, since they depend on the explanatory variables values for subject i (vector xi). It holds y:= E(Yi 1 xi). and pli = E(Yi 1 xi) Remark 2: The vandom sample in univariate GLMs is Y, j=1,-,n, which is written in rector form

Y= (/1, ..., Yn).

In multivariate GLMs the sample is yi = (Yis, -, Yi, 3-1), i=1,-, n, and in vector form: $\gamma = (\gamma_1, \ldots, \gamma_{J-1})$ Analogously, we have univariate GLM: $\theta = (\theta_{\ell}, \dots, \theta_{n})$ multivariate GLM: (0 = (01, -, 01, 0n) with $\Theta_i = (\theta_{i1}, \dots, \theta_{i,j-1})$ For inferential purposes compare the log-likelihood function for m indep. responses / ~ EDF (8i, p) (s. Slide 38) to the log-likelihood for n indep. responses : ~ MEDF (Bi, p) (5. Definition II. 4.8 in Scide 129) $l(\beta) = \sum_{i=1}^{n} l_i = \sum_{i=1}^{n} log f(\mathbf{y}; \mathbf{\theta}; \boldsymbol{\phi}) = \sum_{i=1}^{n} \frac{\mathbf{y}}{a(\boldsymbol{\phi}, i)} \frac{\partial g}{\partial a(\boldsymbol{\phi}, i)} + \sum_{i=1}^{n} c(\mathbf{y}, \boldsymbol{\phi})$