Individual i's flow utility for option j at time t is:

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$$U_{ijt} = u_{ijt} + \epsilon_{ijt}$$

$$= X_{it}\alpha_j + \epsilon_{ijt}$$

Individual i chooses sequence $\{d_{i\tau}\}_{\tau=t}^{T}$ to maximize her expected lifetime utility:

$$\max_{\{d_{i\tau}\}_{\tau=t}^{T}} \mathbb{E}\left\{\sum_{\tau=t}^{T}\sum_{j=1}^{J}\beta^{\tau-t}1\left[d_{i\tau}=j\right]U_{ij\tau}\left(X_{i\tau},\epsilon_{ij\tau}\right)\right\} \tag{1}$$

Let's break down each component:

Individual i chooses sequence $\{d_{i\tau}\}_{\tau=t}^{T}$ to maximize her expected lifetime utility:

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$\{d_{i\tau}\}_{\tau=t}^{T}$: Sequence of choices from period t to terminal period T

Individual i chooses sequence $\{d_{i\tau}\}_{\tau=t}^{T}$ to maximize her expected lifetime utility:

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$\mathbb{E}$: Expectation over future utility shocks $\epsilon_{ij\tau}$ and/or states $X_{i\tau}$ for $\tau > t$

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$\sum_{\tau=t}^{T}$: Sum over all time periods from current (t) to terminal (T)

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$\sum_{j=1}^{J}$: Sum over all choice alternatives j

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$\beta^{\tau-t}$: Discount factor for utility received in period τ

(captures time preference and impatience; i.e. future utility is worth less than present)

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$1[d_{i\tau}=j]$: Indicator function equals 1 if alternative j is chosen at time τ

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$U_{ij\tau}(X_{i\tau},\epsilon_{ij\tau})$: Flow utility from choice j at time τ

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Key insight: Individual knows current ϵ's but must form expectations over future ϵ's

Individual i takes expectations over:

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- X's (future states)
- ϵ's (future errors)—unknown to both analyst and decision maker

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Key assumptions:

- ϵ's are i.i.d. over time
- Future states are not affected by ϵ's except through choices

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$$\mathbb{E}(X_{t+1}|d_t, \ldots, d_1, \epsilon_t, \ldots, \epsilon_1) = \mathbb{E}(X_{t+1}|d_t, \ldots, d_1)$$

Future states are not affected by ϵ's except through history of choices:

$$\mathbb{E}(X_{t+1}|d_t, \ldots, d_1, \epsilon_t, \ldots, \epsilon_1) = \mathbb{E}(X_{t+1}|d_t, \ldots, d_1)$$

i.e., ϵ's do not directly influence the evolution of X's beyond their effect on d

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Assume mood 2 semesters ago doesn't affect transcript (except through courses taken)