For i in 1 to n we have $y_i(s)$ where $s \in S$ - functional response
For j in 1 to p we have functional covariates $x_{ij}(t)$ where $t \in T_j$

Functional response	Functional covariate 1	… j …	Functional covariate p
$y_1(s)$	$x_{11}(t)$		$x_{p1}(t)$
$y_2(s)$	$x_{12}(t)$		$x_{p2}(t)$
… i …			
$y_n(s)$	$x_{1n}(t)$		$x_{pn}(t)$

Concurrent functional linear model
Assumption:
1. $T_j = S$

Model:

$$y_i(s) = \alpha(s) + \sum_{j=1}^{p} x_{ij}(s)\psi_j(s) + e_i(s)$$

$\alpha(s)$ - functional intercept
$\psi_j(s)$ - functional regressor coefficients
$e_i(s)$ - functional zero-mean error

Non concurrent (More general approach)
Assumption:
1. $T_j \neq S$

Model:

$$y_i(s) = \alpha(s) + \sum_{j=1}^{p} \int x_{ij}(t)\psi_j(t, s) + e_i(s)$$

? We are not really interested in it cause for us $T_j = S$ (1)

Historical functional linear model
Assumption:
1. $T_j = S$

Model:
$T(s) = \{t \in T : t < s\}$

$$y_i(s) = \alpha(s) + \sum_{j=1}^{p} \int_{T(s)} x_{ij}(t)\psi_j(t, s) + e_i(s)$$

? Note (2)
? Интегральное уравнение но ядро $\psi_j(t, s)$ наоборот неизвестно (Неоднородное уравнение Фредгольма второго рода)?

Introduced model

? Motivation (3)
? Каждый эксперимент независимый или мы просто добавляем дозу?

Our model

$y_i(d) = \sum_{j=1}^{p} k_{ji}(d)\beta_j(d) + e(d)$ ***or can be written as*** $y_i(d) = \sum_{j=1}^{p} k_{ij}(d)\beta_j(d) + e_i(d)$

* So domains of $y_i(*)$ and $k_{ij}(*)$ with $\beta_j(*)$ are the same. We can use ***Concurrent functional linear model***
* Do we need other model (non concurrent or historical)?

Sparsity

?Note (4)