Final decomposition model

ESTP Training

Regression model

- *Additive case:*

$$y_c = \alpha \cdot cal + \beta \cdot out + \gamma \cdot reg + \mu$$

- *Multiplicative case:*

$$ln(y_c) - ln(lp) = \alpha \cdot cal + \beta \cdot out + \gamma \cdot reg + \mu$$

- $cal = [tde \quad ee \quad omhe]$
- $out = [out_t \quad out_s \quad out_i]$
- $reg = [reg_t \quad reg_s \quad reg_i \quad reg_{sa} \quad reg_y \quad reg_u]$
- $\mu = "linearized\ series"$

Handling of the regression variables

Code	Description	Y_lin	T	S	I	SA
tde	Trading days (default, holidays, user-defined)	x		x		
ee	Easter	x		x		
omhe	Other moving holidays (TODO: Ramadan…)	x		x		
AO	Additive outlier	x			x	x
TC	Transitory change	x			x	x
LS	Level shift	x	x			x
SO, SLS	Seasonal outlier / seasonal level shift	x		x		
Reg_i	Regression variables allocated to irregular, IV (p)	x			x	x
Reg_t	Regression variables allocated to trend, ramps, IV (p)	x	x			x
Reg_s	Regression variables allocated to seasonal, IV (p)	x				
Reg_sa	Regression variables allocated to seas. adjusted	x				x
Reg_y	Regression variables removed before decomposition					
Reg_u	Regression variables unallocated to a component	x	p	p	p	p

p stands for partially

Decomposition

- Additive case:

$$\gamma_u \cdot reg_u + \mu = y_{cmp} = t_{cmp} + s_{cmp} + i_{cmp}$$

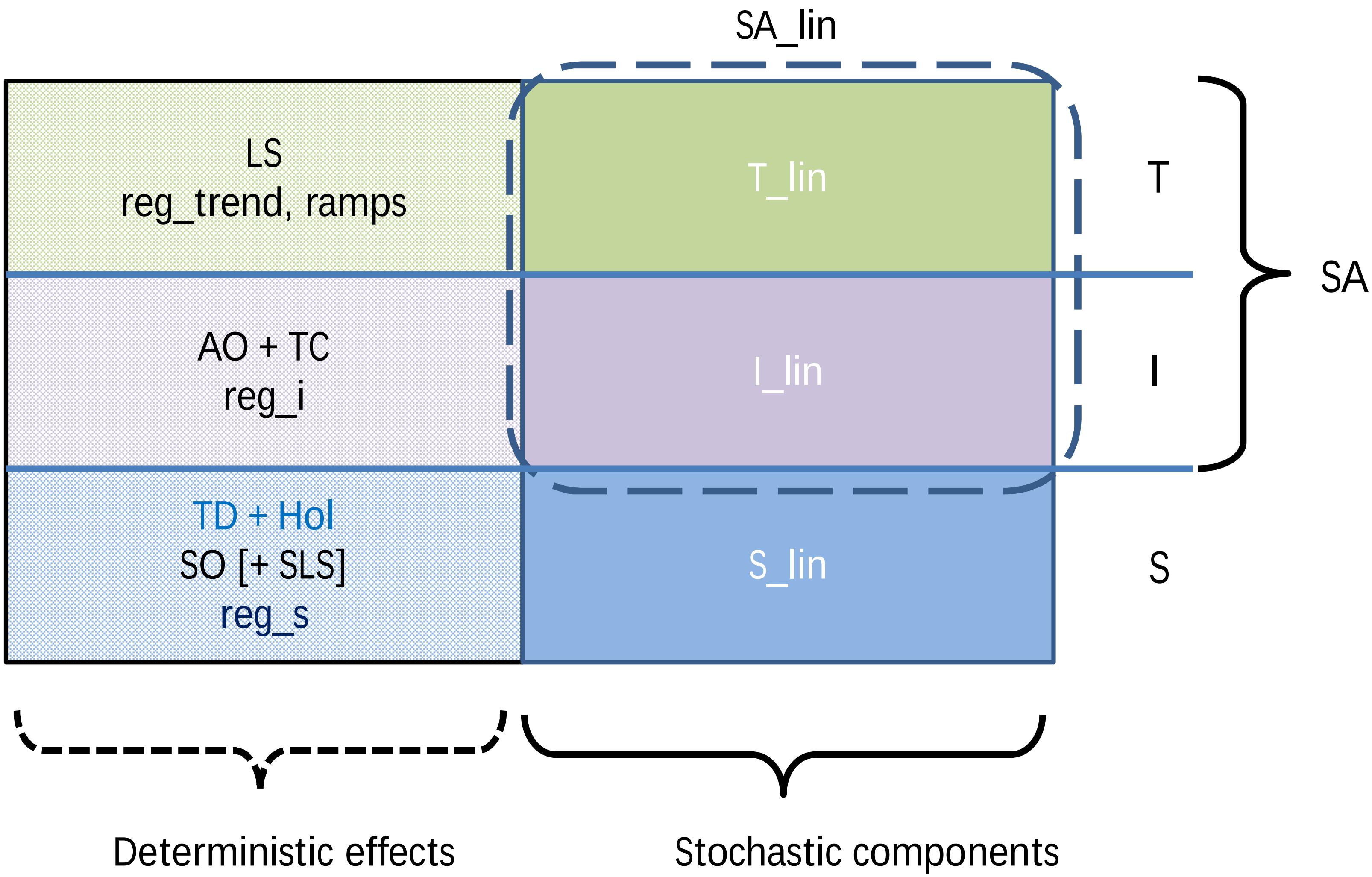
- Multiplicative case:

$$\gamma_u \cdot reg_u + \mu = y_{lin} = t_{lin} + s_{lin} + i_{lin}$$

$$exp(\gamma_u \cdot reg_u + \mu) = y_{cmp}$$
$$= t_{cmp} \cdot s_{cmp} \cdot i_{cmp}$$

Final decomposition

- Additive case:
  - ✓ $t = out_t + \ reg_t + t_{cmp}$
  - ✓ $s = cal + out_s + \ reg_s + s_{cmp}$
  - ✓ $i = out_i + \ reg_i + i_{cmp}$
  - ✓ $sa = t + i + \ reg_{sa} = y_c - \ reg_y - s$
  - ✓ $y_c = s + t + i + \ reg_y$
- Multiplicative case:
  - ✓ $t = exp(out_t \cdot \ reg_t) \cdot t_{cmp}$
  - ✓ $s = exp(cal \cdot lp \cdot out_s \cdot \ reg_s) \cdot s_{cmp} = exp\left(\widetilde{cal} \cdot out_s \cdot \ reg_s\right) \cdot s_{cmp}$
  - ✓ $i = exp(out_i \cdot \ reg_i) \cdot i_{cmp}$
  - ✓ $sa = t \cdot i \cdot exp\ (reg_{sa}) = \left(y_c / exp\left(reg_y\right)\right) / s$
  - ✓ $y_c / \ exp\left(reg_y\right) = s \cdot t \cdot i$


SA_lin
LS
reg_trend, ramps
T_lin
T
SA
AO + TC
reg_i
I_lin
I
TD + Hol
SO [+ SLS]
reg_s
S_lin
S
Deterministic effects
Stochastic components