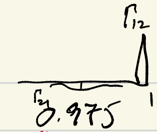
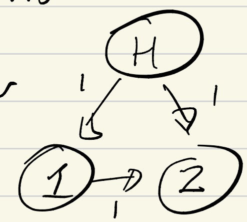
31/3/20 Val + me

(1) Problems w/. Γ_{21} when $X_1 \to X_2$ w/. confounder,  , but OK in other cases

should be 0.875

Not sure what this means — need lots of data when there's confounders
But could it be an error? 0.975 vs 0.875 seems odd! He has t_4 data and confounder



$$\Gamma_{21} = \frac{1}{2} + \frac{1}{2}\,\frac{3}{3+1} = \frac{7}{8}, \quad \Gamma_{12} = \frac{1}{2} + \frac{1}{2}\,\frac{2}{2} = 1.$$

using Lemma 1 of the paper.

(2) Parametric estimator using GPD for tails — doesn't seem to improve on NP estimator, nor does full GP, but they are so similar that including covariates seems potentially a good idea.

(3) Covariates (H) included, OP says it works. What's the formula? Q

$X_1 = \beta H + \varepsilon,\ X_2 = \beta H + \beta X_1 + \varepsilon \qquad X_2 \mid X_2 > u \sim GP(\xi, \sigma = \beta_0 + \beta_1 H)$ Q? $\Rightarrow$, what? (*)

$\Rightarrow$ confounder is a problem in Gnecco et al., but seems to fix things

Would be good to have results for different ? in the various tails. $\Rightarrow$ More sims w/. larger model.
Look at data

(*) $X_1 = \beta H + \varepsilon_1,\ \varepsilon_1 \sim t_4 \Rightarrow \Pr(X_1 > u + x \mid X_1 > u) = \Pr(\beta H + \varepsilon_1 > x + u \mid \beta H + \varepsilon_1 > u) = \Pr(\varepsilon_1 > x + u - \beta H \mid \varepsilon_1 > u - \beta H)$

$\sim \boxed{(x + u - \beta H)^{-\nu}(u - \beta H)^{+\nu}} = \left\{1 + \frac{x}{u - \beta H}\right\}^{-\nu} = \left(1 + \frac{(1/\nu)\,x}{(1/\nu)(u - \beta H)}\right)^{-\nu}$

$\Rightarrow X_1 \mid H,\ X_1 > u \sim GP\left(\frac{1}{\nu}, \frac{(u - \beta H)}{\nu}\right)$

Check this

$H > 0$?

$\min_i (u - \beta H_i) > 0$
$= u - \beta \max H_i > 0$
$\Rightarrow \frac{u}{\max H_i} > \beta$

$\nu > 0$

$\Pr(T_\nu > t) \sim (1 + t^2/\nu)^{-\nu/2},\ t \to \infty$

$\Rightarrow \Pr(T_\nu > t + u \mid T_\nu > u) = \left\{\frac{1 + (t+u)^2/\nu}{1 + u^2/\nu}\right\}^{-\nu/2} = \left[\frac{\nu + u^2 + 2tu + t^2}{\nu + u^2}\right]^{-\nu/2} = \left[1 + \frac{t^2}{\nu + u^2} + \frac{2tu}{\nu + u^2}\right]^{-\nu/2} \sim \frac{t^{-\nu}}{(\nu + u^2)^{-\nu/2}}$

$\frac{X_1}{u - \beta H} > 0$

gamGPD fit
↳ w/. constraints?