*set seed;
*set π=Pr$\left\{i^{th}, j^{th}\text{ element is missing}\right\} \in [0,1]$
*set N; $*N = 10$;
*set p; $*p = 3$;
*set q; $*q = 2$;
*fix x; $*X = \boldsymbol{I}_2 \otimes \mathbf{1}_{N/2}$
*fix B- a $(p \times q)$ matrix of slopes and intercepts; *may need either full row or column rank;

$$\boldsymbol{B} = \begin{bmatrix} 1 & 5 & 8 \\ 2 & 9 & 2 \end{bmatrix}$$

*fix Sigma (pxp), full rank, positive definite of rank p;

$$\boldsymbol{\Sigma} = \begin{bmatrix} 1 & 0.3 & 0.3 \\ 0.3 & 1 & 0.3 \\ 0.3 & 0.3 & 1 \end{bmatrix}$$

*generate Z; $*\boldsymbol{Z} \sim N_{N,p}(\mathbf{0}, \boldsymbol{I}_p, \boldsymbol{I}_N)$
*Choleskey decompose Sigma so that

$$\boldsymbol{\Sigma} = \boldsymbol{U}\boldsymbol{U}'$$

*define

$$\boldsymbol{L} = \boldsymbol{U}'$$

*generate E;

$$\boldsymbol{E} = \boldsymbol{L}\boldsymbol{Z}$$

$*$check

$$\text{cov}\left\{[\text{row}_i(\boldsymbol{E})]'\right\} = \boldsymbol{\Sigma}$$

*form

$$\boldsymbol{Y} = \boldsymbol{X}\boldsymbol{B} + \boldsymbol{E};$$

*now make things missing;
*eventually this will be the Bahjat Qaqish missingness process;
*right now, use a uniform random number generator to generate an $(N \times p)$ matrix $\boldsymbol{M}$ which has a 1 in it if that number is supposed to be missing, and a 0 otherwise.
*sort $\boldsymbol{M}$ and hence $\boldsymbol{Y}$ by deletion classes. * no point in this now, since random deletion, but if we end up with non-random deletion, it will be nice to sort $\boldsymbol{Y}$ and $\boldsymbol{X}$

* Go through cascade to delete things
*you need to delete the rows where everything is missing.
*follow the directions in the paper to reduce Y--> Yif--Ykt-->star thing, X is going to Xif --> Xkt --> X star thing.

*Estimate Beta and Sigma