Simulations

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First design of simulations

The first design considers

$$\mathbf{A} = \sqrt{1-\sigma^2}\begin{pmatrix} \alpha_3\mathbf{1}_{3,50} & \mathbf{0}_{3,50} & \mathbf{0}_{3,900} \\ \mathbf{0}_{2,50} & \alpha_2\mathbf{1}_{2,50} & \mathbf{0}_{2,900} \end{pmatrix}_{(5,1000)} \quad \text{and} \quad \mathbf{D} = \sqrt{1-\sigma^2}\begin{pmatrix} \alpha_3\mathbf{1}_{3,1} & \mathbf{0}_{3,1} & \mathbf{0}_{3,1} \\ \mathbf{0}_{2,1} & \alpha_2\mathbf{1}_{2,1} & \mathbf{0}_{2,1} \end{pmatrix}_{(5,3)}, \tag{1}$$

where $\forall k \in \mathbb{N}^\star,\ \alpha_k = 1/\sqrt{k}$, $\sqrt{1-\sigma^2} = 0.99$ and

$$\boldsymbol{\psi} = (\boldsymbol{\phi}', \boldsymbol{\epsilon}'_{1\dots100}/\sigma, \boldsymbol{\epsilon}'_{101\dots1000}, \boldsymbol{\xi}'_{1\dots2}/\sigma, \xi_3)' \sim \mathcal{N}\left(\mathbf{0}, \mathbb{I}_{5+1000+3}\right).$$

The corresponding latent variable model is then:

$$x_j = \begin{cases} \sqrt{1-\sigma^2}(\phi_1+\phi_2+\phi_3)/\sqrt{3} + \epsilon_j & \text{for} \quad j = 1\dots50 \\ \sqrt{1-\sigma^2}(\phi_4+\phi_5)/\sqrt{2} + \epsilon_j & \text{for} \quad j = 51\dots100 \\ \epsilon_j & \text{for} \quad j = 101\dots1000 \end{cases} \quad \text{and} \quad \begin{cases} y_1 = \sqrt{1-\sigma^2}(\phi_1+\phi_2+\phi_3)/\sqrt{3} + \xi_1 \\ y_2 = \sqrt{1-\sigma^2}(\phi_4+\phi_5)/\sqrt{2} + \xi_2 \\ y_3 = \xi_3 \end{cases} \tag{2}$$