Tutorial – Matching Models

Problem 1. We'll first generate the data we want to use in our analysis. We want a sample consisting of a single marriage market of 500 men and women for whom we observe their education, age, height, and BMI. We'll also prepare the sample for use with the *affinitymatrix* package in R. The example below draws from its documentation, which is based on Chiappori *et al.* (2024).

1. Define the number of observations N and the type space (i, j)
2. Draw a sample from a centered multivariate normal distribution (hint: use the `mvrnorm` function from the MASS package). Read in the covariance matrix `Tutorial_CovMat.csv` and use it in the sampling.[1]
3. Consider the object you have just generated.
   - What does it represent?
   - How can we connect this covariance matrix to the concepts discussed in class?
4. Now create two matrices i and j with observations for individual men and women.

Problem 2. We now estimate the Dupuy and Galichon (2014) model that we looked at in class using the R package *affinitymatrix*.

1. Study the documentation of the `estimate.affinity.matrix()` function.
2. Use the function to estimate the affinity matrix for our model. What do we observe?
   - How do we interpret the diagonal elements of this matrix?
   - What about the sign?
   - How does this relate to the concepts we have seen in class?
3. Perform a rank-test on the affinity matrix using `show.test()`
   - What does this tell us?
4. Perform a saliency analysis using `show.saliency()`
   - How can we interpret these estimates?
5. Visualize your findings using `show.correlations()` and interpret the result again.

[1] If problems would occur with reading in the covariance matrix, refer to the appendix.

References

Chiappori, P.-A., Ciscato, E. and Guerriero, C. (2024). Analyzing matching patterns in marriage: Theory and application to Italian data. *Quantitative Economics*, **15** (3), 737–781.

Dupuy, A. and Galichon, A. (2014). Personality traits and the marriage market. *Journal of Political Economy*, **122** (6), 1271–1319.

Appendix

The covariance matrix for sampling synthetic observations should look as follows:

$$\begin{bmatrix} 1 & 0.326 & 0.1446 & -0.0668 & 0.5712 & 0.4277 & 0.1847 & -0.2883 \\ 0.326 & 1 & -0.0372 & 0.0215 & 0.2795 & 0.8471 & 0.1211 & -0.0902 \\ 0.1446 & -0.0372 & 1 & -0.0244 & 0.2186 & 0.0636 & 0.1489 & -0.1301 \\ -0.0668 & 0.0215 & -0.0244 & 1 & 0.0192 & 0.0452 & -0.0553 & 0.2717 \\ 0.5712 & 0.2795 & 0.2186 & 0.0192 & 1 & 0.3309 & 0.1324 & -0.1896 \\ 0.4277 & 0.8471 & 0.0636 & 0.0452 & 0.3309 & 1 & 0.0915 & -0.1299 \\ 0.1847 & 0.1211 & 0.1489 & -0.0553 & 0.1324 & 0.0915 & 1 & -0.1959 \\ -0.2883 & -0.0902 & -0.1301 & 0.2717 & -0.1896 & -0.1299 & -0.1959 & 1 \end{bmatrix}$$

If you are unable to read in the supplied covariance matrix, you can input it manually.