Tutorial – Matching Models

Solutions

Problem 1. Data generation. Refer also to the code with solutions `Tutorial_MatchingModels.R`.

1. See code. There are four types for both males i and females j, defined by education, age, height, and BMI.

2. See code.

3. Note that the covariance matrix is simply a correlation matrix as the elements have been normalized.[1] We can connect the covariance or correlation matrix to the affinity matrix. The correlations between the same characteristics for men and women hint towards the sign and degree of assortative matching on that characteristic. However, correlation between different characteristics may also be important. As Dupuy and Galichon (2014) note, even if we would observe positive correlation between partners' education and partners' height, there may be negative complementarities in, say, height, if there is a positive association between education and height and the positive complementarities in education dominate the negative ones in height.

4. See code.

Problem 2. Estimation using *affinitymatrix* R package. Refer also to the code with solutions `Tutorial_MatchingModels.R`.

1. See documentation of `estimate.affinity.matrix()` function.

2. The affinity matrix represents the degree or intensity of sorting between any pair of male and female characteristics.

   - The diagonal elements are informative about the nature of sorting with respect to a single attribute. Positive diagonal elements imply positive assortative matching with respect to that particular attribute (and negative assortative matching for negative diagonal elements). For example, the results show positive assortative matching with respect to education, age, and BMI. Age is, by large, the most important dimension of sorting, which should not be surprising.
   - The affinity matrix relates directly to the match surplus. In fact, we can interpret the diagonal elements in terms of the joint surplus. For example, increasing both the male and female education by a standard deviation would increase the joint surplus by 0.74 units.
   - Note that some off-diagonal elements are also significantly different from zero, implying important trade-offs between attributes. For example, male education interacts negatively with female BMI, indicating that couples where the wife has a higher BMI tend to decrease the joint surplus whenever the male is more highly educated.

[1] The main advantage of using standardized characteristics is that the magnitude of the estimated coefficients in the affinity matrix will be directly comparable across attributes, allowing a direct interpretation in terms of comparative statics.

- Finally, note that the affinity matrix is not symmetric, indicating that preferences for attributes are not similar between men and women.

3. The rank tests show that we can reject the hypotheses that the rank of the affinity matrix is one or two, suggesting that the rank is at least three. However, we subsequently cannot reject that the rank equals three, suggesting that sorting occurs on three dimensions. Note that the rank test is based on jointly testing the significance of the singular values of the affinity matrix (see saliency analysis below).

4. While the affinity matrix sheds light on the assortative nature of matching patterns, as well as on possible trade-offs between different characteristics, saliency analysis allows us to derive a set of indices that each explain a **mutually exclusive** part of the match surplus. This is useful for a number of reasons: First, it allows us to test the hypothesis that attractiveness is well summarized by a single index subsuming numerous observable traits. Second, when multiple dimensions matter, it quantifies their relative importance. Finally, it allows to describe the role played by each of the characteristics in each dimension of assortativeness.

    - The number of indices derived by the saliency analysis can never exceed the number of characteristics or traits considered in the matching problem. In our case this is four.
    - Clearly, the first index explains the bulk of all matching patterns (more than 75%). Again, unsurprisingly, this index loads heavily on age, reflecting that people tend to marry within their "cohort". Age is positively correlated with education, reflecting the well-known fact that more educated people tend to both marry and have children later. This explains the positive and significant impact of education on the first factor.
    - The second index singles out individuals who are more educated, as well as taller and, at least for women, thinner. In other words, matching patterns, while primarily driven by age, also capture a mix of education and physical appearance, possibly reflecting various dimensions of social status.
    - The final two indices explain an economically negligible part of the match surplus, although the third index is significantly different from zero. This explains the result from the rank test: Matching seems to occur on three separate dimensions.

5. This is simply a graphical illustration of the results from the saliency analysis. For each of the characteristics, the graph plots, on the x-axis, the correlation between the first or second matching index and the observed trait for men. On the y-axis, a similar correlation is depicted for women. This mimics the loadings presented in the first columns of the saliency tables. However, one can also relate the matching indices to other *observed outcomes* that one may have available in the data. For example, child or relationship outcomes, or observed labor market behavior.

References

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