Evaluation of Market Outcomes - Assignment 3

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Problem 1

Please refer to the attached RStudio file for a detailed solution.

2. Estimate the affinity matrix

```
> aff_mat = show.affinity.matrix(res, labels_i, labels_j)
> gsub("\\}", "***", gsub("\\\\hline|textbf\\{|\t|&|\n", "", aff_mat))
      [,1]              [,2]                  [,3]
[1,] ""                "Cognitive Job Demand" "Manual Job Demand"
[2,] "Cognitive Skill" "0.40***"              "0.03"
[3,] ""                "(0.03) "              "(0.02) "
[4,] "Manual Skill"    "-0.07***"             "0.41***"
[5,] ""                "(0.02) "              "(0.03) "
```

- **Cognitive Skill and Cognitive Job Demand:** (strong positive coefficient 0.40***) these workers are well-matched to roles that require high cognitive skill

- **Cognitive Skill and Manual Job Demand:** (small coefficient 0.03) highly cognitive-skilled workers are not necessarily matched with highly manual-intensive jobs

- **Manual Skill and Cognitive Job Demand:** (negative coefficient -0.07***) workers with higher manual skills may be less likely to be matched with cognitively demanding jobs
  $\Rightarrow$ This could indicate a trade-off in skill matching; manual expertise might not be beneficial in cognitively demanding roles

- **Manual Skill and Manual Job Demand:** (strong and positive coefficient 0.41***) workers with high manual skills are well-matched to jobs requiring manual skills

3. The rank test

```
> rank_test = show.test(res)
> gsub("\\}", "***", gsub("\\\\hline|textbf\\{|\t|&|\n", "", rank_test[c(1, 2, 4),]))
     [,1]             [,2]
[1,] "$H_0$: $rk(A)=k$" "$k=1$"
[2,] "$chi^2$"          "140.96"
[3,] "Rejected?"        "Yes"
```

– From the results:

- **Test Decision**: Rejected

- **Null Hypothesis** ($H_0 = 1$): the affinity matrix has a rank greater than 1
  $\Rightarrow$ multiple factors influence the matching process between workers and firms, rather than a single dominant pattern.

- **Chi-squared statistic** ($\chi^2 = 140.96$): strong statistical evidence against the hypothesis that the affinity matrix has minimal rank

– Relation to Singular Value Decomposition: In saliency analysis, a high rank implies that the affinity matrix has more than one meaningful dimension, reinforcing the idea that skill matching is multidimensional rather than being driven by a single factor.

Problem 2

Please refer to the attached RStudio file for a detailed solution.

2. The matching patterns

```
> print(surplus_matrix)
              1              2              3              4
1 -6.903899e-04 -0.0004350005 -0.0001213766 -1.625363e-05
2 -2.648172e-04 -0.0003655573 -0.0003711271 -1.099309e-04
3 -7.106058e-05 -0.0002611208 -0.0005318300 -4.597643e-04
4  0.000000e+00 -0.0000291850 -0.0002519101 -8.568108e-04
```

- **Diagonal values, negative:** some degree of assortative matching, meaning individuals tend to pair with similar education levels

- **Higher negative values:** a stronger preference for education homogeneity, meaning highly educated individuals are more selective in matching

- **Lower negative values:** weaker matching tendencies across different education levels

- **Education group 4 (higher education):** the strongest negative surplus, indicating that those with the highest education have fewer optimal matching opportunities compared to random pairing

3. Male (α_{ij}) and Female (γ_{ij}) preferences

The Choo & Siow (2006) model helps us infer male (α_{ij}) and female (γ_{ij}) preferences from the surplus matrix.

- α_{ij}/γ_{ij}: represents how much one gender prefers certain the other's education levels in a partner

- **Higher surplus values:** mutual attraction between certain education groups

- **Negative surplus values:** weaker preference or less frequent matching between certain groups