HW2 Advanced DCM

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Table 1

Variable	Categories	Percent
DISCOUNT	1	47.3
GA	1	12.3
VEH_AVAI	1	66.8
VEH_AVAI	2	17.9
VEH_AVAI	3	15.4
EDUC	1	9.8
EDUC	2	50.8
EDUC	3	39.4
WORKING	0	32.4
WORKING	1	16.4
WORKING	2	43.9
WORKING	3	7.3
HH_INC_A	10000	8.5
HH_INC_A	30000	10.0
HH_INC_A	50000	15.9
HH_INC_A	70000	19.0
HH_INC_A	90000	20.4
HH_INC_A	112500	12.6
HH_INC_A	137500	6.0
HH_INC_A	167500	7.6

Table 2

Distance	Commuting	Shopping	Business	Leisure	Total
<5	22.0	29.2	1.3	14.1	18.5
5-10	15.9	25.0	2.6	7.3	13.0
10-20	22.0	23.7	6.5	11.5	16.7
20-30	15.7	13.1	9.1	11.3	12.8
30-50	14.3	5.5	14.3	14.6	12.7
50-75	5.5	2.1	14.3	10.2	7.5
75-100	2.7	0.4	7.8	10.4	6.0
>100	1.9	0.8	44.2	20.6	12.7

Table 3

	Business	Commuting	Leisure	Shopping
Mode choice: car vs. bus	6	162	186	126
Mode choice: car vs. rail	426	1716	2538	1104
Route choice: bus for bus users	9	405	450	342
Route choice: car for car users	156	846	1176	660
Route choice: rail for car users	126	594	837	504
Route choice: rail for rail users	324	1008	1881	288
Total	1047	4731	7068	3024

Trip Purpose	Total	Avg Income	Avg Trip Distance
Business	77	98223.50	97.62
Commuting	364	84655.99	23.10
Leisure	548	75181.45	60.18
Shopping	236	76703.87	14.03
Total	1225	79816.16	42.80

Table 4

```
## Model run using Apollo for R, version 0.2.6 on Windows by trish
## www.ApolloChoiceModelling.com
##
## Model name                       : Swiss_VOT
## Model description                : Model from Axhausen
## Model run at                     : 2022-02-26 11:22:28
## Estimation method                : bfgs
## Model diagnosis                  : successful convergence
## Number of individuals            : 1225
## Number of rows in database       : 15870
## Number of modelled outcomes      : 15870
##                                1 : 480
##                                2 : 5784
##                                3 : 1206
##                                4 : 2838
##                                5 : 2061
##                                6 : 3501
##
## Number of cores used             :  4
## Model without mixing
##
## LL(start)                        : -11000.25
## LL(0, whole model)               : -11000.25
## LL(C, whole model)               : -10657.19
## LL(final, whole model)           : -8961.455
## Rho-square (0)                   :  0.1853
## Adj.Rho-square (0)               :  0.1806
## Rho-square (C)                   :  0.1591
## Adj.Rho-square (C)               :  0.1542
## AIC                              :  18026.91
## BIC                              :  18425.86
##
## LL(0,1)                          : -332.7106
```

```
## LL(final,1)                     : -285.3311
## LL(0,2)                         : -4009.163
## LL(final,2)                     : -2294.178
## LL(0,3)                         : -835.9355
## LL(final,3)                     : -835.9338
## LL(0,4)                         : -1967.152
## LL(final,4)                     : -1864.612
## LL(0,5)                         : -1428.576
## LL(final,5)                     : -1343.271
## LL(0,6)                         : -2426.708
## LL(final,6)                     : -2337.26
##
## Estimated parameters            :  52
## Time taken (hh:mm:ss)           :  00:45:14.07
##      pre-estimation             :  00:00:30.92
##      estimation                 :  00:21:46.25
##      post-estimation            :  00:22:56.9
## Iterations                      :  96
## Min abs eigenvalue of Hessian   :  1441762
## Some eigenvalues of Hessian are positive, indicating potential
##   problems!
##
## Unconstrained optimisation.
##
## Estimates:
##                            Estimate        s.e.   t.rat.(0)    Rob.s.e.
## asc_a                       0.00000          NA          NA          NA
## asc_b                      -0.02923    0.013466     -2.1707          NA
## b_tt_pt_business           -0.03740    0.011501     -3.2515          NA
## b_tt_pt_commuters          -0.05024    0.004682    -10.7302          NA
## b_tt_pt_leisure            -0.02072    0.002518     -8.2281          NA
## b_tt_pt_shopping           -0.03507    0.013895     -2.5243          NA
## b_tt_car_business          -0.03872    0.007387     -5.2415          NA
## b_tt_car_commuters         -0.05638    0.006782     -8.3133          NA
## b_tt_car_leisure           -0.02831    0.002373    -11.9309          NA
## b_tt_car_shopping          -0.04476    0.007494     -5.9736          NA
## b_dc                       -0.02951    0.004367     -6.7584          NA
## b_tc_business              -0.03496         NaN         NaN          NA
## b_tc_commuters             -0.10958    0.010220    -10.7225          NA
## b_tc_leisure               -0.05198    0.004047    -12.8450          NA
## b_tc_shopping              -0.10521    0.016859     -6.2409          NA
## b_ic_business               0.02826         NaN         NaN          NA
## b_ic_commuters             -0.04313         NaN         NaN          NA
## b_ic_leisure               -0.08768         NaN         NaN          NA
## b_ic_shopping               0.06643         NaN         NaN          NA
## b_hw_business               0.02826         NaN         NaN          NA
## b_hw_commuters             -0.04313         NaN         NaN          NA
## b_hw_leisure               -0.08768         NaN         NaN          NA
## b_hw_shopping               0.06643         NaN         NaN          NA
## b_bus_commuters             0.44350         NaN         NaN          NA
## b_bus_leisure               0.33229         NaN         NaN          NA
## b_bus_shopping              0.52444         NaN         NaN          NA
## b_rail_business            -0.08941         NaN         NaN          NA
## b_rail_commuters           -0.62184         NaN         NaN          NA
```

```
## b_rail_leisure               -0.35848         NaN         NaN          NA
## b_rail_shopping              -0.62835         NaN         NaN          NA
## b_car_inertia                 1.41251    0.135342     10.4366          NA
## b_car_available               0.33125         NaN         NaN          NA
## b_car_male                   -0.16336    0.041572     -3.9295          NA
## b_bus_disc                    0.31097         NaN         NaN          NA
## b_rail_disc                   1.04191    0.118886      8.7639          NA
## b_bus_ga                      0.94033         NaN         NaN          NA
## b_rail_ga                     1.15893    0.178875      6.4790          NA
## lam_dist_tt_pt_business       0.04632    0.212676      0.2178          NA
## lam_dist_tt_pt_commuters      0.05457    0.082042      0.6652          NA
## lam_dist_tt_pt_leisure        0.14408    0.070350      2.0481          NA
## lam_dist_tt_pt_shopping       0.25857    0.916330      0.2822          NA
## lam_dist_tt_car_business      0.02880    0.140657      0.2048          NA
## lam_dist_tt_car_commuters     0.17858    0.093912      1.9015          NA
## lam_dist_tt_car_leisure    1.175e-07         NaN         NaN          NA
## lam_dist_tt_car_shopping      0.26189    0.328816      0.7965          NA
## lam_dist_tc                2.263e-07         NaN         NaN          NA
## lam_inc_tc_business           0.09364         NaN         NaN          NA
## lam_inc_tc_commuters         -0.16747    0.079241     -2.1134          NA
## mu_mc_car_bus                 1.56207         NaN         NaN          NA
## mu_mc_car_rail                0.83321    0.046052     18.0928          NA
## mu_rc_bus                     0.89314    2.063802      0.4328          NA
## mu_rc_car                     2.40590    0.318311      7.5583          NA
## mu_rc_rail_by_car             1.78161    0.303097      5.8780          NA
## mu_rc_rail                    1.00000          NA          NA          NA
##                          Rob.t.rat.(0)
## asc_a                               NA
## asc_b                               NA
## b_tt_pt_business                    NA
## b_tt_pt_commuters                   NA
## b_tt_pt_leisure                     NA
## b_tt_pt_shopping                    NA
## b_tt_car_business                   NA
## b_tt_car_commuters                  NA
## b_tt_car_leisure                    NA
## b_tt_car_shopping                   NA
## b_dc                                NA
## b_tc_business                       NA
## b_tc_commuters                      NA
## b_tc_leisure                        NA
## b_tc_shopping                       NA
## b_ic_business                       NA
## b_ic_commuters                      NA
## b_ic_leisure                        NA
## b_ic_shopping                       NA
## b_hw_business                       NA
## b_hw_commuters                      NA
## b_hw_leisure                        NA
## b_hw_shopping                       NA
## b_bus_commuters                     NA
## b_bus_leisure                       NA
## b_bus_shopping                      NA
## b_rail_business                     NA
```

```
## b_rail_commuters                    NA
## b_rail_leisure                      NA
## b_rail_shopping                     NA
## b_car_inertia                       NA
## b_car_available                     NA
## b_car_male                          NA
## b_bus_disc                          NA
## b_rail_disc                         NA
## b_bus_ga                            NA
## b_rail_ga                           NA
## lam_dist_tt_pt_business             NA
## lam_dist_tt_pt_commuters            NA
## lam_dist_tt_pt_leisure              NA
## lam_dist_tt_pt_shopping             NA
## lam_dist_tt_car_business            NA
## lam_dist_tt_car_commuters           NA
## lam_dist_tt_car_leisure             NA
## lam_dist_tt_car_shopping            NA
## lam_dist_tc                         NA
## lam_inc_tc_business                 NA
## lam_inc_tc_commuters                NA
## mu_mc_car_bus                       NA
## mu_mc_car_rail                      NA
## mu_rc_bus                           NA
## mu_rc_car                           NA
## mu_rc_rail_by_car                   NA
## mu_rc_rail                          NA
```