

IO Coding Exercise 2 Report

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January 19, 2023

The mean valuations that generate the market shares provided are:

cdid	prodid	δ_{jt}
1	1	-2.597734
1	2	-5.348822
1	3	-2.339402
1	4	-2.575706
1	5	-3.060063
1	6	-2.614559
1	7	-2.26602
1	8	-2.633748
1	9	-2.521002
2	1	-1.851079
2	3	-4.539921
2	5	-2.461928
2	7	-2.393193
2	9	-2.676727

Our R code is as follows:

```
#Function 1
ind_sh <- function(expmval, expmu, ns, cdid, cdindex){
  eg <- expmu*matrix(kronecker(rep(1, ns), expmval), nrow=14) #14x50 (numerator)
  temp <- apply(eg, 2, cumsum) #14x50
  sum1 <- temp[cdindex,] #2x50
  sum1[2:nrow(sum1),] <- diff(sum1) #2x50
  denom1 <- 1/(1+sum1) #2x50
  denom <- denom1[cdid,] #14x50 (denominator)
  f <- eg*denom #14x50
}

#Function 2
mktsh <- function(mval, expmu, ns, cdid, cdindex){
  f <- rowMeans(ind_sh(mval, expmu, ns, cdid, cdindex)) #14x1 (numerical integration)
}

#Import Data
mumat <- read.csv('mumat.csv')
mumat <- as.matrix(mumat)

#Initialization
J <- dim(mumat)[1]
s_jt <- matrix(mumat[, 3], nrow=J)
```

```

expmu <- exp(mumat[,4:ncol(mumat)])
ns <- ncol(expmu)
cdid <- matrix(mumat[,1],nrow=J)

#Construct cdindex from cdid
cdidtemp <- cdid
for(i in 1:(length(cdid)-1)){
  if(cdid[i] == cdid[i+1]){
    cdidtemp[i] <- 0
  }
  else{
    cdidtemp[i] <- 1
  }
}
cdidtemp[length(cdid)] <- 1
cdindex <- which(cdidtemp == 1)

#Contraction Mapping
norm <- 1
tol <- 1e-12
mvalold <- matrix(rep(1,J),nrow=J) #Initial guess exp(delta^0)=1
while(norm > tol){
  mval <- mvalold*s_jt/mktsh(mvalold,expmu,ns,cdid,cdindex)
  t <- abs(mval-mvalold)
  norm <- max(t)
  mvalold <- mval
}
logmval <- log(mval) #We want delta, not exp(delta)

```