Codes used in Data preprocessing:

1. Subset the data asper need:

k1 = na.omit(work\_1)

write.csv(k1, "k1.csv")

k = k1[1:7]

1. Normalization of variables:

dat1 = scale(k)

norm = ((dat1 - mean(dat1)/ sd(dat1)))

norm

write.csv(norm, "normal1.csv")

1. PCA:

## PCA##

wk = read.csv("normal.csv")

wk1 = round(wk[2:8],2)

wk3 <- wk1[2:7]

fit <- princomp(wk3,scores = TRUE, cor=TRUE)

work\_5 <- round(fit$scores, 2)

write.csv(work\_5,"Work\_5\_1.csv")

summary(fit) # Which one to take

loadings(fit) # pc loadings

plot(fit$scores[,1])

pairs(fit$scores)

title(main="Principal Component Analysis\_fit.scores")

plot(fit,type="lines") # scree plot

# the principal components

scatter.smooth(fit$scores)

biplot(fit)

write.csv(work\_5[,3:4], "Factor\_scores.csv")

#par(mfrow = c(2,1))

#### Communalities

com1 <- (loadings(fit)[2,1]^2 + loadings(fit)[2,2]^2 + loadings(fit)[2,3]^2)

com2 <- (loadings(fit)[2,1]^2 + loadings(fit)[2,2]^2)

com3 <- (loadings(fit)[2,1]^2 + loadings(fit)[2,2]^2 + loadings(fit)[2,3]^2 + loadings(fit)[2,4]^2)

com4 <- (loadings(fit)[2,6]^2 + loadings(fit)[2,7]^2)

com5 <- (loadings(fit)[2,7]^2 + loadings(fit)[2,5]^2 + loadings(fit)[2,6]^2 + loadings(fit)[2,5]^2 + loadings(fit)[2,4]^2) #loadings(fit)[2,2]^2)

com1; com2; com3

com4; com5

com5

## Bartlett's test for sphericity ##

library("psych")

corrmat <- cor(wk1, method = "pearson")

cortest.bartlett(corrmat, n = dim(wk1)[1])

## Varimax ##

fit\_vmx <- principal(wk1, nfactors=5, rotate="varimax")

fit\_vmx

# Maximum Likelihood Factor Analysis

# with varimax rotation

fit\_fact1 <- factanal(wk3, 3, rotation="varimax", scores="regression")

print(fit\_fact1, digits=2, cutoff=.3, sort=TRUE)

data\_fact <- cbind(round(wk$e,2), round(fit\_fact1$scores,2))

write.csv(data\_fact, "fact.csv")