Analisis Komponen Utama

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library(readxl)

## Warning: package 'readxl' was built under R version 4.1.3

per5 <- read\_excel ("D:/1. LECTURE/SEMESTER 7/SKRIPSI/Data SUR.xlsx")  
datapca <- per5[,2:10]  
nama <- per5[,1]

#uji normal multivariat  
library(mvnTest)

## Warning: package 'mvnTest' was built under R version 4.1.3

## Loading required package: mvtnorm

HZ.test(datapca)

## Henze-Zirkler test for Multivariate Normality   
##   
## data : datapca   
##   
## HZ : 1.087512   
## p-value : 3.080522e-09   
##   
## Result : Data are not multivariate normal (sig.level = 0.05)

#Matriks dekomposisi  
svd(datapca)

## $d  
## [1] 5.605076e+04 3.692646e+03 4.881811e+02 6.636730e+01 2.141130e+01  
## [6] 1.593539e+01 7.474738e+00 1.374730e+00 1.527268e-01  
##   
## $u  
## [,1] [,2] [,3] [,4] [,5]  
## [1,] -0.10333590 -0.4505935202 -0.01607263 0.07981170 0.180252086  
## [2,] -0.24688194 -0.1835571554 -0.06537723 0.16190319 0.029628785  
## [3,] -0.10259421 -0.1006804260 0.09747160 -0.11353997 -0.357567176  
## [4,] -0.10185533 0.0537012727 0.14618498 0.15677416 0.096658881  
## [5,] -0.06430432 -0.0120718173 0.16854154 0.04204312 -0.062923209  
## [6,] -0.12448404 0.1049960313 0.15260225 -0.07164297 0.124003340  
## [7,] -0.03751500 -0.0076429430 0.20823806 -0.08388503 0.126731029  
## [8,] -0.12676493 0.1442034658 0.18330908 -0.07633050 0.036585678  
## [9,] -0.02104136 0.0086133603 0.21858306 0.26650575 0.072610081  
## [10,] -0.02901393 -0.0009313017 0.21878343 0.18466541 -0.022557677  
## [11,] -0.08297892 0.1865796843 0.20000467 0.41851465 0.375495511  
## [12,] -0.53272975 0.2671770369 -0.18607701 -0.10776649 -0.121633719  
## [13,] -0.44421678 0.1627184821 -0.11556586 -0.02067205 0.077294498  
## [14,] -0.04783159 0.0447170540 0.24970449 0.03537769 0.097098774  
## [15,] -0.49879673 -0.0669011377 -0.25565683 0.07447940 0.057805404  
## [16,] -0.13396723 0.0964157713 0.16129108 -0.05948943 -0.236649554  
## [17,] -0.05687798 0.0628713539 0.24306909 0.06848648 -0.219359234  
## [18,] -0.08690157 0.0653856035 0.20419413 -0.14738283 0.036057358  
## [19,] -0.14753394 -0.6144283130 -0.10393380 -0.03806526 0.202882613  
## [20,] -0.11651245 -0.0371076050 0.10543050 0.05609660 -0.093633774  
## [21,] -0.07024700 -0.0605919535 0.12242431 0.09503235 -0.095057425  
## [22,] -0.07172546 -0.1474875585 0.12262265 0.07303487 -0.248394944  
## [23,] -0.05424431 -0.0068419118 0.18783279 0.18195089 0.025055794  
## [24,] -0.01412846 -0.0420167213 0.20759338 0.02863172 -0.126661040  
## [25,] -0.06239395 -0.1488563953 0.14104367 0.06384082 -0.151942753  
## [26,] -0.07813497 -0.2284735325 0.09345248 -0.07168454 -0.078820442  
## [27,] -0.16432248 -0.0046524796 0.10687106 0.07289560 -0.042360966  
## [28,] -0.06394214 0.0238551956 0.20921776 -0.06348851 -0.002495399  
## [29,] -0.02611033 -0.0911355582 0.19217626 -0.09743309 0.133170548  
## [30,] -0.03642649 -0.1418822195 0.16883705 -0.06182600 -0.052964852  
## [31,] -0.05197063 -0.0248185786 0.19215760 -0.16737622 0.094372115  
## [32,] -0.04139537 -0.2079696979 0.13810187 -0.05471403 -0.361665898  
## [33,] -0.02927634 -0.0829732646 0.19416427 -0.15876810 0.379199218  
## [34,] -0.06566261 0.0347703231 0.15663112 -0.66342705 0.185701038  
## [,6] [,7] [,8] [,9]  
## [1,] 0.005701821 -0.287132476 -0.2765901824 0.171064973  
## [2,] -0.202852405 0.132276976 -0.0308110632 0.037162610  
## [3,] 0.055210209 -0.312481018 0.0824050794 -0.001201029  
## [4,] -0.001939613 0.116382786 -0.0355632516 0.145828459  
## [5,] -0.178671804 0.236166158 -0.1148810059 -0.029530120  
## [6,] 0.047146159 -0.003325835 -0.1513310842 -0.013973037  
## [7,] 0.107731615 0.103411441 -0.2460577260 -0.189221959  
## [8,] 0.037774628 0.178288373 -0.2006325359 -0.111118360  
## [9,] 0.024191580 0.118478395 0.0244602582 0.100171924  
## [10,] -0.406378356 -0.254596658 -0.1581461229 -0.177465335  
## [11,] 0.040965340 -0.314516549 -0.0674567864 0.079601714  
## [12,] -0.087404178 -0.204200608 0.0547087479 0.007563882  
## [13,] 0.139666187 0.047728169 0.0384491620 -0.031121085  
## [14,] 0.066646889 0.241163738 0.0983983553 -0.203478855  
## [15,] 0.026603453 0.206396808 -0.0167784292 0.070628777  
## [16,] -0.009837449 -0.408337004 0.0795722559 -0.014653267  
## [17,] 0.043275159 0.137658977 0.2573545888 -0.101670610  
## [18,] 0.547726895 -0.212342524 -0.0130274981 0.014795716  
## [19,] 0.095218021 -0.017335636 0.1002598237 -0.331221361  
## [20,] -0.139310702 0.071590555 -0.0909725244 0.109643994  
## [21,] -0.050219684 0.140905909 0.0142486595 0.098872396  
## [22,] 0.128242550 0.047911223 0.1852970466 0.067102866  
## [23,] -0.109048759 -0.036584630 0.0575425548 -0.157508149  
## [24,] 0.024277218 0.053225423 -0.1270664811 0.246024020  
## [25,] -0.114490079 -0.161199582 -0.1193531216 0.024491795  
## [26,] 0.071059671 0.081967679 0.0763616748 -0.076106697  
## [27,] -0.044710484 0.131737613 0.0529605411 -0.031242860  
## [28,] 0.088980826 0.135450059 0.1419841342 -0.160116436  
## [29,] 0.325209369 -0.072777445 -0.0441938926 -0.137330385  
## [30,] 0.155212122 0.118024513 -0.1850959508 0.544390618  
## [31,] -0.236166252 -0.077952872 0.0006315152 -0.305544615  
## [32,] -0.085528538 0.054244869 0.0197933385 0.021479483  
## [33,] -0.207728776 -0.084764206 0.6811784511 0.335337748  
## [34,] -0.287785242 0.041569194 -0.2104666317 0.130286502  
##   
## $v  
## [,1] [,2] [,3] [,4] [,5]  
## [1,] -0.0000322476 -0.0003610639 0.0041568345 -0.026710601 0.0741053611  
## [2,] -0.0001269291 -0.0012645250 0.0152251653 -0.082033633 0.2213202568  
## [3,] -0.0008929789 -0.0042086998 0.0872166239 -0.029907260 0.0457120507  
## [4,] -0.9848645832 0.1733233390 -0.0003113083 -0.000784223 0.0001339990  
## [5,] -0.0056119370 -0.0277838141 0.6933813178 0.686719569 0.2020983326  
## [6,] -0.0061633143 -0.0364248089 0.7073957369 -0.629602971 -0.3118394671  
## [7,] -0.1731206798 -0.9837687169 -0.0468001588 0.006150223 -0.0002581224  
## [8,] -0.0007156425 -0.0061984823 0.0826329499 -0.347962796 0.8969054103  
## [9,] -0.0004194783 -0.0012494568 0.0440367909 0.050619839 -0.0301522610  
## [,6] [,7] [,8] [,9]  
## [1,] -3.127996e-02 -0.0234696990 4.984145e-01 8.624565e-01  
## [2,] -5.624508e-02 -0.0459730669 8.278916e-01 -5.033615e-01  
## [3,] 9.277340e-01 -0.3576526730 2.790202e-02 2.514066e-03  
## [4,] -9.322642e-05 0.0001850230 8.698523e-06 -1.937407e-06  
## [5,] -2.503138e-02 0.0731659611 3.387958e-03 -3.255425e-04  
## [6,] -5.946297e-02 0.0319086812 5.338704e-03 -5.031845e-04  
## [7,] -1.746385e-04 -0.0004053297 -1.695028e-05 1.232699e-05  
## [8,] -5.786530e-02 -0.0051115459 -2.479012e-01 5.278180e-02  
## [9,] -3.572909e-01 -0.9289900256 -6.248957e-02 1.819867e-03

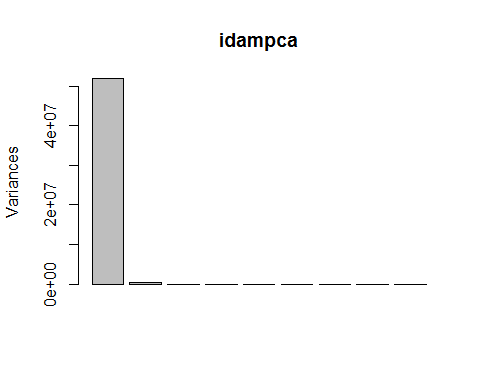
idampca <- prcomp(datapca)  
summary(idampca)

## Importance of components:  
## PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8  
## Standard deviation 7200.2867 6.08e+02 11.55 8.069 3.685 2.578 1.286 0.2241  
## Proportion of Variance 0.9929 7.08e-03 0.00 0.000 0.000 0.000 0.000 0.0000  
## Cumulative Proportion 0.9929 1.00e+00 1.00 1.000 1.000 1.000 1.000 1.0000  
## PC9  
## Standard deviation 0.02434  
## Proportion of Variance 0.00000  
## Cumulative Proportion 1.00000

idampca$rotation

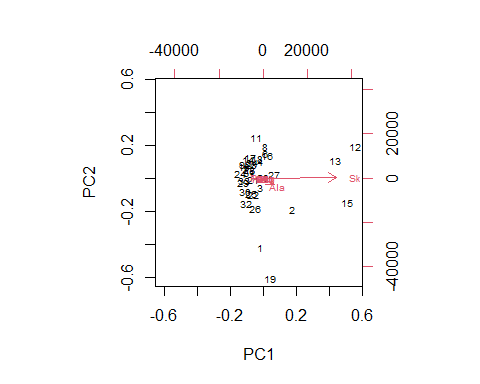
## PC1 PC2 PC3 PC4 PC5  
## P2 -6.403964e-06 -0.0001695399 0.0267200764 -3.235420e-03 0.0720670768  
## P1 -1.311169e-05 -0.0005655506 0.0820969481 -4.246537e-03 0.2181287815  
## Ks 1.626981e-04 -0.0002820373 0.0311224340 1.951914e-01 0.1345963506  
## Sk 9.880825e-01 0.1539229800 0.0007846784 4.120839e-05 0.0001309176  
## Sn -1.352688e-04 0.0037796942 -0.6806117604 6.729704e-01 0.2489310373  
## Pt 1.425130e-04 -0.0042390884 0.6359277710 7.130838e-01 -0.2644471472  
## Ala 1.539250e-01 -0.9880630679 -0.0061590539 -5.329906e-04 -0.0002922620  
## Kem -3.084227e-05 -0.0024085966 0.3483568046 -6.197699e-03 0.8902613847  
## Peng 6.060210e-05 0.0007775920 -0.0504976375 -2.134128e-02 -0.0681586594  
## PC6 PC7 PC8 PC9  
## P2 0.0415786468 -0.0297099252 5.119477e-01 8.540375e-01  
## P1 0.0850790399 -0.0601006229 8.170285e-01 -5.169870e-01  
## Ks -0.9134013866 -0.3276776293 3.375145e-02 1.245446e-03  
## Sk 0.0001196931 0.0001781593 8.186432e-06 -2.012854e-06  
## Sn 0.1389524067 0.0506532519 -4.844520e-03 7.398265e-04  
## Pt 0.1303124947 0.0131048851 -1.947902e-03 3.988743e-04  
## Ala 0.0001098836 -0.0004039873 -2.022730e-05 1.306976e-05  
## Kem 0.1381138802 -0.0156292252 -2.517901e-01 5.761961e-02  
## Peng 0.3183804206 -0.9408244518 -7.621939e-02 4.710647e-03

plot(idampca)



biplot(idampca, cex=0.6, xlab="PC1", ylab="PC2")

## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped  
  
## Warning in arrows(0, 0, y[, 1L] \* 0.8, y[, 2L] \* 0.8, col = col[2L], length =  
## arrow.len): zero-length arrow is of indeterminate angle and so skipped



g12 <- idampca$x[,1:2]  
grup <- as.data.frame(g12)  
grup[,3] <- ifelse((grup[,1]>0 & grup[,2]>0), 1,  
 ifelse((grup[,1] > 0 & grup[,2] < 0), 2,  
 ifelse((grup[,1] < 0 & grup[,2] > 0), 3,  
 ifelse((grup[,1] < 0 & grup[,2] > 0), 4, 0))))  
  
colnames(grup) <- c("PC1", "PC2", "Group")  
grup

## PC1 PC2 Group  
## 1 -726.15479 -1498.80664 0  
## 2 7337.63552 -671.68012 2  
## 3 -742.51153 -204.95404 0  
## 4 -772.79122 366.31280 3  
## 5 -2881.97893 165.20728 3  
## 6 499.01287 530.94419 1  
## 7 -4383.02420 211.65696 3  
## 8 629.58852 673.74013 1  
## 9 -5305.02428 289.81787 3  
## 10 -4858.95609 245.92151 3  
## 11 -1821.05793 878.17801 3  
## 12 23389.46938 676.07730 1  
## 13 18421.45783 388.97624 1  
## 14 -3801.21893 394.43229 3  
## 15 21463.71735 -520.55986 2  
## 16 1029.77352 489.14492 1  
## 17 -3292.92217 451.36814 3  
## 18 -1610.12923 427.01419 3  
## 19 1738.94706 -2153.23025 2  
## 20 42.06702 14.49941 1  
## 21 -2552.34628 -21.25148 0  
## 22 -2475.85923 -343.34038 0  
## 23 -3445.41108 195.90252 3  
## 24 -5696.07786 110.38721 3  
## 25 -2998.94768 -337.79607 0  
## 26 -2122.50555 -649.66825 0  
## 27 2723.62485 82.06047 1  
## 28 -2899.79269 299.01060 3  
## 29 -5028.17602 -84.18573 0  
## 30 -4453.70735 -283.12099 0  
## 31 -3574.15584 132.18007 3  
## 32 -4179.98752 -532.96466 0  
## 33 -4850.16812 -57.49221 0  
## 34 -2802.38942 336.21857 3

#Hasil pengelompokkan kemiskinan  
library(dplyr)

## Warning: package 'dplyr' was built under R version 4.1.3

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

data\_result <- per5%>%  
 mutate(Kelompok = grup$Group) %>%  
 arrange(Kelompok)  
  
Hasil <- data\_result%>%  
 select(Provinsi, Kelompok) %>%  
 arrange(Kelompok)  
Hasil

## # A tibble: 34 x 2  
## Provinsi Kelompok  
## <chr> <dbl>  
## 1 ACEH 0  
## 2 SUMATERA BARAT 0  
## 3 KALIMANTAN TENGAH 0  
## 4 KALIMANTAN SELATAN 0  
## 5 SULAWESI UTARA 0  
## 6 SULAWESI TENGAH 0  
## 7 GORONTALO 0  
## 8 SULAWESI BARAT 0  
## 9 MALUKU UTARA 0  
## 10 PAPUA BARAT 0  
## # ... with 24 more rows