VAR Model on endogenous

```
library(tscount)
library(urca)
```

```
#Load dataset
full_df <- read.csv("/home/angps/Documents/Thesis/Data/data.csv")
df_atleast_50cts <- read.csv("/home/angps/Documents/Thesis/Data/data_>=50cts.csv")
```

```
#RMSE function definition
RMSE = function(act, pred){
  sqrt(mean((act - pred)^2))
}

#Split into training and test set
#train <- df_atleast_50cts[,1:162]
#test <- df_atleast_50cts[,163:204]

train <- df_atleast_50cts
```

```
df_t <- t(df_atleast_50cts)
colnames(df_t) = c(1:42)
stationary_test = ca.jo(df_t, type="trace", K=2, ecdet="none", spec="longrun")
```

```
## Warning in ca.jo(df_t, type = "trace", K = 2, ecdet = "none", spec = "longrun"):
## Too many variables, critical values cannot be computed.
```

```
summary(stationary_test)
```

```
##
## ######################
## # Johansen-Procedure #
## ######################
##
## Test type: trace statistic , with linear trend
##
## Eigenvalues (lambda):
##  [1] 0.87712757 0.86068138 0.82401474 0.79792877 0.74702587 0.73939604
##  [7] 0.71640761 0.70259911 0.68830776 0.68132734 0.64453743 0.62334225
## [13] 0.60465670 0.59799498 0.57235046 0.55567879 0.53906021 0.52377198
## [19] 0.50317394 0.48469327 0.45058583 0.42977749 0.42013754 0.39098820
## [25] 0.38125760 0.35909872 0.34594538 0.33160017 0.30271337 0.29755653
## [31] 0.26401050 0.25093414 0.23574040 0.22323620 0.21376157 0.19732584
## [37] 0.18529218 0.15881207 0.14903131 0.13298241 0.08545450 0.07359689
##
## Values of test statistic
##
##                 [,1]
## r <= 41 |   15.44206
## r <= 40 |   33.48632
## r <= 39 |   62.31092
## r <= 38 |   94.90967
## r <= 37 |  129.84358
## r <= 36 |  171.23858
```

```
## r <= 35 |  215.63948
## r <= 34 |  264.21951
## r <= 33 |  315.24854
## r <= 32 |  369.55579
## r <= 31 |  427.91932
## r <= 30 |  489.84028
## r <= 29 |  561.18474
## r <= 28 |  634.01760
## r <= 27 |  715.39708
## r <= 26 |  801.15909
## r <= 25 |  891.02482
## r <= 24 |  987.99821
## r <= 23 | 1088.17357
## r <= 22 | 1198.25636
## r <= 21 | 1311.72555
## r <= 20 | 1432.70389
## r <= 19 | 1566.62847
## r <= 18 | 1707.93057
## r <= 17 | 1857.78599
## r <= 16 | 2014.23253
## r <= 15 | 2178.09645
## r <= 14 | 2349.68560
## r <= 13 | 2533.76633
## r <= 12 | 2721.22248
## r <= 11 | 2918.45899
## r <= 10 | 3127.39473
## r <= 9 |  3358.40008
## r <= 8 |  3593.87935
## r <= 7 |  3838.83955
## r <= 6 |  4093.40345
## r <= 5 |  4365.04364
## r <= 4 |  4642.68618
## r <= 3 |  4965.71146
## r <= 2 |  5316.65717
## r <= 1 |  5714.79751
## r = 0  |  6138.31245
##
## Eigenvectors, normalised to first column:
## (These are the cointegration relations)
##
##               X1.12        X2.12        X3.12       X4.12        X5.12
## X1.12    1.00000000   1.00000000    1.0000000  1.00000000  1.000000000
## X2.12    4.41195731  -3.58839689   20.7595135 -0.87597002 -1.598393911
## X3.12    4.58815179   7.13116717   60.2794996  1.11259680 -0.989338528
## X4.12   -3.83905506  -0.01455212  -45.7877801 -0.60812578 -0.041678855
## X5.12    1.76345953   1.62027302   -7.4661192 -1.68899484  0.799632041
## X6.12   -0.75250745   4.60718890  -39.5251371  1.40021187  2.180779412
## X7.12   -0.38429152  -4.39928037   -2.3705069 -1.55709104  0.006772728
## X8.12  -12.71747553   0.56508127  164.2713462 -1.35523841  7.711810224
## X9.12    5.64287440   1.86011861   13.3078247  1.14415225 -0.865071308
## X10.12   4.96181980   8.25044715    9.8372352  1.11161042  2.506207218
## X11.12  -5.94006327   4.39140398   19.8191727  3.80937618 -4.843817654
## X12.12   4.75446321   8.96582373  -12.2918535  0.01842404 -1.618777069
## X13.12   7.03564411  -3.10331112   95.6938545 -1.12075203  2.968571943
```

```
## X14.12   2.63778675   0.72457746   -3.7556140  0.10757008  1.197352920
## X15.12  -0.04085906   9.16053326  -97.8691357  2.35887268 -3.139960941
## X16.12   3.69025973  -4.40599430  -46.3253403  4.21272993 -5.297788724
## X17.12   6.51998859   6.42981429   23.8558293  3.32493542  6.658004157
## X18.12  -2.65078663  -4.13611729 -114.3956950  2.97496951 -0.913124642
## X19.12 -10.97722032  -2.14985611   65.3049655  0.82816761 -4.660915820
## X20.12   9.34374066  -2.83090182  -56.6046375 -4.11811191  0.437623104
## X21.12  -9.69809152  -2.63267511   85.3438335  3.08120818 -4.949262904
## X22.12  -2.15669282   0.46108550    0.4725726 -0.80870581 -2.551275410
## X23.12  -7.82706043  -9.79793223   38.0910721 -3.26815054 -1.624188061
## X24.12   6.03693365   4.53074405  -22.0861399 -0.49647039  1.654154805
## X25.12   4.96070413   4.65330532  -17.8218727 -0.73041982 -3.851615506
## X26.12 -13.76135409  -0.82114445  -18.4313751  0.29434661 -1.728893044
## X27.12  -4.11173960  -4.51190646  -44.0216431 -4.06181978  1.363219705
## X28.12  -0.56244584 -10.06982404   10.0421408  2.20273545  2.820915367
## X29.12   3.99130466  -1.88963233  -38.4769390 -1.36806546  0.935311605
## X30.12  -2.56699184  11.56819843    6.2924547 -2.02059663 -1.830052553
## X31.12   2.11403774  -3.89359515  -22.4660184 -0.53657890  0.686238508
## X32.12   8.29048659  -7.49691192   93.1575946 -4.40918763  1.486791786
## X33.12  -0.77308809   5.43638203  -87.0793658  1.73176795 -1.856143719
## X34.12   2.84804052  -1.37185926    5.3435491 -0.87462969 -1.085353140
## X35.12  -5.76604952   3.10723712  -22.6657619  2.15357640  2.356354332
## X36.12   3.66966867   1.13235034   13.5923042 -0.57333630  7.201269144
## X37.12   4.51332992  -2.65544510  -20.4427858 -1.14832037  2.054767666
## X38.12 -17.30425976 -11.47824045  -76.3756439  5.70504852  0.435773155
## X39.12  -2.47845250   9.12606740  -42.4706918 -1.39146712  2.685657072
## X40.12   2.68544314   2.52402863  136.7480086  3.32517800  0.535690223
## X41.12  -4.69049137  -3.86794371  -14.8782989 -0.49864890 -1.049543436
## X42.12  -4.62334341  -4.07749093   32.1533572  1.44438889 -1.847548426
##             X6.12       X7.12       X8.12      X9.12      X10.12
## X1.12   1.0000000    1.000000  1.00000000  1.0000000   1.0000000
## X2.12  -2.8959272 -111.295100 -0.64268710  4.4116566  28.4771646
## X3.12  -0.7431350  -57.177980 -1.58103348 -1.5222356  12.1260586
## X4.12   0.3374343   28.253423  0.09794823 -1.3444995  15.3396811
## X5.12   1.1250540    2.553205 -2.08224619  1.0929452   8.7038559
## X6.12  -0.5869490   93.007697  2.85099428  2.2252014 -22.3494758
## X7.12   0.2931437  -36.019826  1.25921560  0.2956750  12.9567750
## X8.12   1.2133403 -255.254971 -1.50767199 -3.1038945  -7.4327195
## X9.12   0.1187780  -64.621155 -0.88979837 -3.7513324  -9.7740766
## X10.12  0.5238072   71.129354  1.92285319  1.0811761   5.3052820
## X11.12 -1.8686872    6.884802 -1.03355185 -5.1421371  -3.7628631
## X12.12 -0.8440219  -38.229929 -2.03096885 -0.1193284  -8.0732691
## X13.12  3.4195227  102.881135 -1.37174140 -0.2953942  22.3986563
## X14.12  0.8497181  -70.889933  0.55486467  3.2894029  -5.1108255
## X15.12 -2.4205660 -260.454892 -0.53600919 -4.6850719 -23.0200113
## X16.12 -1.0224430   52.986213  1.33256254 -7.3118706 -19.3010919
## X17.12 -3.8885226  106.061511 -3.32291186 -4.4479659 -10.4053701
## X18.12 -0.3398167  190.498630  2.38007711 -2.9932966 -51.3002800
## X19.12 -0.3985928   92.508567  7.42972003 -3.1276756  16.5424623
## X20.12 -0.2691936  -27.014127 -0.87914765 -2.1923436 -31.1848792
## X21.12 -1.1828293   80.174539  0.74063974  0.5301342  14.8563978
## X22.12 -1.0610787  108.795119  0.97801435 -0.7238301  -1.9865648
## X23.12  2.6167741  179.487883 -1.40303937  0.6462444  10.2510171
## X24.12 -6.9754267 -101.541242  3.11690420  2.9774038  35.7968221
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## X25.12 -0.8787368  197.780102 -2.88263116 -4.0910238   2.3528546
## X26.12  1.1346060   77.641032  0.96309417  0.3768911 -26.8570945
## X27.12 -1.4731350  -82.090746  1.16278514  4.7698471  48.8178780
## X28.12  1.2649476  -51.356604  1.67566857 -4.7186348 -10.1114012
## X29.12 -0.9301515   45.855560 -0.55505599 -1.7741743  -1.9013082
## X30.12  1.9079843  -59.889985 -0.32732262 -3.5384151 -27.3932055
## X31.12  0.8522655  -12.505391 -0.92108390  1.4089680  -9.6244066
## X32.12 -0.1886823  -34.915311  0.47058615 -2.3783219  29.3786130
## X33.12 -1.8714934  -43.642618  1.19324829  2.2463966  21.7431226
## X34.12 -0.5054050  -18.638640  0.08140262  0.9225133   0.3905060
## X35.12  0.9400780   63.472517 -0.74332645 -2.0688965   8.8854281
## X36.12 -3.5647914 -320.242401 -2.95681813  5.9098417 -96.9240404
## X37.12  3.7078877  -34.802395  0.27956095 -1.6467911  -5.7158827
## X38.12 -2.0137874  167.130686  4.83282237 -0.3886885  22.3485502
## X39.12  3.0554053   68.035299 -0.48056639  4.4277211  41.1431146
## X40.12 -1.9545118   40.641991  3.74341451  6.3439244 -32.1484529
## X41.12  1.4906997  -95.749703  0.36719178  3.3914818  -0.3392033
## X42.12  1.3817783  -55.773678 -0.13770153  1.4296626  -2.0106126
##              X11.12       X12.12      X13.12      X14.12      X15.12
## X1.12   1.000000000   1.00000000  1.00000000  1.00000000  1.00000000
## X2.12  -3.330977885   1.86823980 -0.38410691  3.94122215 -1.91774932
## X3.12  -1.414096290  -3.52231134 -0.94110887 -0.07638861  0.41768918
## X4.12   0.349932110  -6.60404738 -1.89374849 -0.04547119  0.80550898
## X5.12  -1.143502360 -15.10515548 -1.71531689 -0.93455117 -1.66929449
## X6.12  -1.290353815  12.41505331 -1.73198911  1.81102894  0.17217830
## X7.12   0.007022992  -2.33355257 -0.37384327 -1.03329620 -0.42146942
## X8.12   0.121796484  -8.75885340 -0.68056997 -3.73342141 -0.09694229
## X9.12   0.850409749  -1.90193448 -4.16456414  1.05085792  1.10875873
## X10.12 -1.555566186 -13.05876057 -1.32318561 -2.06635015 -1.59460236
## X11.12  5.022793794 -30.98427780  0.93289045  0.20605517 -1.79591651
## X12.12 -2.931433645  17.58205880 -0.13043751 -0.23236470 -1.96660777
## X13.12  3.038282431  11.65808310  0.91403785  2.53844347 -0.85555991
## X14.12  0.185294691  -6.19380011  1.75390672 -1.35659068  0.42050701
## X15.12 -2.838045802 -18.70121175 -2.37115947  1.17146295 -1.66484460
## X16.12  6.596564827  -0.06546879  5.17921767 -0.05814120  2.17487807
## X17.12  2.238910427   2.08213668  2.93778913 -0.47806420 -1.38483891
## X18.12 -0.597668987  18.29423931 -1.91597951 -1.68030706  1.43454710
## X19.12  2.159582314 -15.88813156 -1.41974485  1.39642868  0.07998367
## X20.12  0.453097731  -7.91023039 -0.24648829 -0.85891686 -0.14450863
## X21.12 -1.418514416  31.94074560 -4.52170328  0.42256849 -0.71530570
## X22.12  1.806584788  17.40573591  1.57845361  0.80217932  1.34907529
## X23.12 -1.627524130  -8.08124242  5.18687486 -2.62421796  0.60439296
## X24.12 -0.480068011 -17.90257794  5.09099829 -1.29439539 -0.03845929
## X25.12  1.480891072   6.05871575 -0.54098581 -1.84849688 -1.64582311
## X26.12 -4.595580993 -11.78718017  3.67119075  1.72651914  0.51045574
## X27.12 -3.786823925  23.05338739 -4.36154123  2.01782560 -0.32470761
## X28.12  1.348069704  26.72023537  2.52933002  1.22473858 -0.73757087
## X29.12 -0.516561091  -1.21227827 -0.92750788  0.55302919 -1.11482609
## X30.12  3.099351198  10.54259821 -0.24948120  0.53952207 -1.08866907
## X31.12 -1.251637357   2.98921259  0.40615676 -0.36582860  0.12155562
## X32.12  1.527464776  -2.84322504  0.12788392 -0.10626882  4.73164685
## X33.12  3.490950003  -3.34957151  2.26573254  0.30442661  2.15714526
## X34.12 -1.071960332   3.01319461 -0.25963414  0.24491699  0.57578348
## X35.12  3.032677575  -4.80604609  2.62520443 -0.63603029 -0.57325947
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## X36.12  1.663571929 -17.61618350 -0.99835952 -2.49402805 -3.20429836
## X37.12 -6.475742200 -10.75187152 -0.13012299 -3.99221416 -2.14415394
## X38.12 -2.460734801 -10.73144032  3.97798690  0.59734638  1.91694045
## X39.12  1.318045238  11.90801275 -1.24498786  2.45313616 -1.31482214
## X40.12  3.701770833 -31.16275806 -0.18687255  1.09468239  0.87818063
## X41.12 -2.250614869  21.04209727  2.97020978  2.05020322 -1.09230977
## X42.12  0.382883391   3.93969026  0.09746338 -2.13958381 -0.24926165
##             X16.12      X17.12      X18.12      X19.12       X20.12
## X1.12   1.000000000  1.00000000   1.0000000  1.00000000    1.0000000
## X2.12  -0.007182283 -2.41260410 -10.2189000  2.04693430   17.1767065
## X3.12  -0.152977744  0.06033087   3.8122557 -1.10516539  -42.0619645
## X4.12  -0.222491087  0.09501286   2.2487524  0.68984396   19.2941254
## X5.12   0.316192864 -3.15614994   2.9065462 -2.15956418  -93.4877797
## X6.12   1.788910368  1.95822126  -1.2700000  0.51609091   50.7265350
## X7.12  -0.197741922 -0.65951357   1.2383874 -1.09846364  -36.9765309
## X8.12  -0.610284011  2.72747229   0.8035964  0.82138750 -149.6012600
## X9.12  -0.152890288 -1.82257898  -2.4256861  1.87255166  -13.5561387
## X10.12 -0.537728949 -1.09188716   2.2270421 -0.38413778   98.7372330
## X11.12  0.067177855 -0.30013902   6.7106748 -0.49768682  123.5542563
## X12.12 -0.059556257 -0.26081043  -9.7567013 -0.33102873  -15.9476708
## X13.12  0.429666823  1.56268802  -9.9972648  0.03279835  -34.3694675
## X14.12 -0.113943707  0.80045814  -3.9511421  3.70523476  -26.8271768
## X15.12 -1.129925799 -0.33903550  21.1917058 -1.17022937   14.0890812
## X16.12 -3.493024662  2.20395658   1.0418823  1.31082200  -29.8583069
## X17.12 -1.319864676 -0.93179011  14.4540811 -1.09702851   21.9659807
## X18.12 -0.109117567 -0.50490842   5.3077202 -1.48566149  -53.0887080
## X19.12  0.867382879  0.91468731  -1.4117868  1.53416203  -66.5187647
## X20.12  0.406397489  4.20449674 -11.2011749 -1.31099918    7.7097137
## X21.12 -0.563738987 -1.90063983  -1.3659615  0.18566554  -15.9385249
## X22.12  0.132108345  3.19690578  -1.4298783  1.37075010   51.1985096
## X23.12  1.871512962 -0.90419723   3.4662277 -1.34853473 -133.0130253
## X24.12  1.167607362  0.79839357   6.8813347  0.94353511 -120.5373370
## X25.12 -0.734212940  0.48942560 -17.5354141 -0.12738809  -35.3060063
## X26.12  0.187218666  1.79130085   4.3881166  1.43987148  -48.6089036
## X27.12  0.221652216 -2.24441040   7.6748254  1.06262061 -232.9848166
## X28.12 -0.824301206 -4.72510846 -10.3811620 -0.01044122  102.3753865
## X29.12 -0.393475445  2.63027596   9.4001036  2.00815563   23.7698077
## X30.12 -0.800066162 -2.19928166   5.1130344  1.23755215  166.6458749
## X31.12  0.425680635 -1.93211456   1.0030029 -0.65398896   15.0316334
## X32.12 -0.393176664  1.72663134  -3.5903793 -0.27468855  231.0220474
## X33.12 -0.525356285 -1.89332424  -7.2533926 -2.57323478   -8.8171038
## X34.12 -0.192205898 -0.04029704   1.4997006 -0.46353502   -1.0388711
## X35.12  0.600381961 -0.82142956  -5.8877747  0.67973586   -0.5874307
## X36.12  0.374531077  0.62591118   3.3650036 -4.93731523 -117.3909443
## X37.12 -0.792460821  1.56577321   9.0554111 -3.76158249  110.0115551
## X38.12  0.120380475 -3.70786624  -5.2757334  0.34435997  112.4084481
## X39.12 -0.853547434  3.73752343 -10.7870598 -0.91423085    3.7743242
## X40.12  0.121038628  4.27056700  -7.7435089  1.04247273  -14.9059934
## X41.12  0.161429370  0.76695031   0.3975884 -2.58519341   -7.9600366
## X42.12  0.947523866  0.08842068  10.1157789  0.80177841   63.3065346
##             X21.12      X22.12       X23.12       X24.12     X25.12
## X1.12   1.00000000  1.00000000    1.0000000   1.00000000  1.0000000
## X2.12  -0.48950454  0.03960558  -79.5163092   2.27315062  2.3474282
## X3.12  -0.17216973  0.33395581    2.1144082  -2.40844023 -1.0787129
```

```
## X4.12  -0.51733792  0.74296271   -7.3227590  -1.06480489 -6.6332369
## X5.12   0.74978276 -1.37399749   35.2205096  -3.87039254  1.0007067
## X6.12   0.37712704 -1.11657717  -98.0013563   4.40354727 -1.4435085
## X7.12  -0.39404620  0.49420469  -15.8895181  -0.14751801  2.4096992
## X8.12  -0.25252223 -1.14915828   25.8123055  -1.47610463 -0.8434049
## X9.12   0.09627989 -0.50425975    3.8987510  -2.56241132 -0.9438381
## X10.12  0.50001891  2.83884834   41.5237536  -0.79953585 -3.3347370
## X11.12  0.82002245 -0.07857983   59.3350991   2.31552308 -3.9995378
## X12.12 -1.33463112  0.74770221   20.4810186  -0.21094337  1.9620857
## X13.12 -1.29869078 -0.59079342  -42.8671830  -0.68422399 -4.4747054
## X14.12  0.26924667 -0.88282862    3.4020048   4.46803411  2.7842954
## X15.12 -1.99220305  1.14708089   -0.5339816   5.26425521 -3.0600910
## X16.12  0.20248954  1.18897044  -33.6256265   2.59645741  0.0134462
## X17.12 -0.93857102 -0.87257541   18.6830089  -1.64988840  3.6788969
## X18.12 -1.12821722  3.13010049   -5.4687349  -1.66639196  3.6532536
## X19.12 -1.30247450 -2.30933706   33.8227994   1.98262103  1.4007126
## X20.12 -0.27390970 -2.65529273   47.8177420   0.00415448  2.4440821
## X21.12  0.89885167  0.07481621   -8.7017683   5.78610583  0.7572543
## X22.12  0.51286747 -0.80613926    1.3336463   0.21999684 -5.4850233
## X23.12  1.17206252  0.45930752 -105.7836983   2.21670069  2.8189815
## X24.12 -1.38351336 -2.38213172   49.9514236  -1.11385452  2.2471015
## X25.12  1.04577159  3.38543266  -47.5754730   3.67668134  0.1669101
## X26.12 -0.04952807  2.41942968   31.4362356  -3.19735155  3.0687695
## X27.12  3.35847818 -3.68184600   18.9151263  -3.93774395  2.1763699
## X28.12  2.34292498  0.91831692  -36.9943408   4.02268966 -4.1039736
## X29.12 -1.48899651  0.73848588  -11.4774893  -1.51684435  3.5279521
## X30.12 -0.12880202 -0.12706174  -14.9129383  -2.19527643  1.2322756
## X31.12 -0.09806052 -0.08732589   19.6684775   0.49953238  0.1566509
## X32.12 -0.78313887  0.59595447   60.4959699   6.60436847  3.4842719
## X33.12 -0.41727111 -2.33607815   15.7146109   3.56211843 -3.3822039
## X34.12  0.21756247  0.51427173   -3.5611213  -0.15667335  0.3538959
## X35.12  0.02259172 -1.14478844   11.1722894  -0.88021739  1.3928172
## X36.12  0.75816588  2.95106407  -20.9122872   6.01120713  2.6661205
## X37.12 -0.47752850 -2.90108859   17.4693434   2.29050591  1.1631829
## X38.12  2.39659932 -4.79968001  -74.8270841 -10.41561453  3.6244309
## X39.12  1.04602667  2.49651860  -10.2311714   2.10631243  9.7971748
## X40.12  0.77241962 -5.75598558    8.4367991  -4.46135209 -8.0853200
## X41.12  1.53013616  0.86099839   14.8798950  -2.68103005 -1.1048708
## X42.12 -0.41808562  0.54731110  -11.9328685  -1.73502895 -0.6552505
##             X26.12       X27.12      X28.12       X29.12      X30.12
## X1.12   1.00000000   1.00000000  1.00000000   1.00000000  1.00000000
## X2.12   0.14797587  -3.41081320 -0.63837719   2.92766931 -1.31184518
## X3.12  -0.18419859   1.60663720  0.69314104   9.69478576  1.14578696
## X4.12   0.44133452  -0.33308711  0.59623058  -0.93319002 -0.92754331
## X5.12  -0.01439609  -7.37386742 -1.06219140  -5.72306242 -2.75460180
## X6.12   0.39536242 -12.09177085 -0.87610136   1.38329361  2.23966394
## X7.12  -0.20641599  -1.66579385  1.19598408   0.54318628  0.61190868
## X8.12   0.31418827  -0.15576786 -1.21198601   0.39190372  0.35423661
## X9.12  -0.69479108   0.07525273 -1.27459665   3.53717980  0.73467214
## X10.12  0.30013227   6.10186078  2.41166625  -0.62283011 -3.40705253
## X11.12 -0.17927493   2.51050198 -0.65856287 -11.37821942  1.91825584
## X12.12 -0.24197024   3.24538460 -2.23649207  -6.07668746 -0.65254202
## X13.12 -0.29369347  -0.09229269  0.28849334  -3.10419789 -0.40277514
## X14.12 -0.32634534  -0.78290479  0.04255787  -2.98923989  0.46145966
```

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## X15.12 -0.69455993  -0.51933052  2.77220235  -2.17210872  0.01835772
## X16.12  0.09790788  -4.20479948  0.71960194  -3.24668089 -0.91146073
## X17.12 -0.56274155   6.70330397  1.65737350  -9.09300256 -1.16514225
## X18.12  0.72680900  12.95161672 -1.62766924  -2.76677772 -1.64971706
## X19.12 -0.96883456   0.10278458 -0.53805314  -4.61731707  2.23022514
## X20.12  0.79064081   4.03735457  2.77675252  -0.51106311 -1.22371812
## X21.12  0.09729335  -1.04666365 -0.66295861  -5.01490542 -2.02965999
## X22.12 -0.98039064   1.01305713 -0.62038363  -2.63147110 -0.07756929
## X23.12 -1.10927915   8.23282469 -2.52742071  -0.23535401 -2.94335721
## X24.12  0.51966636  -9.53970733  0.70141964  18.36915911 -1.98646704
## X25.12 -0.28355669   2.71077072  0.84296880  -3.41823599  3.52437119
## X26.12  0.31443153  -3.41405599 -0.30375345  -2.57580951 -0.93930494
## X27.12  0.65427067  11.71871178 -0.80881751   6.41844230 -1.60293358
## X28.12  0.14728318  -4.93261316  1.29245972  -8.26552747  1.01498400
## X29.12 -0.12615611  -1.91190221 -2.22963687  -1.54590890  0.70198772
## X30.12  0.29145953   2.16496455  0.50823289   1.15878591 -1.44618624
## X31.12 -0.33436470  -1.19266328 -0.74337726   1.94060133  0.60082435
## X32.12 -0.02452100   7.49319489 -1.39427226 -14.29019466 -2.08236857
## X33.12 -0.70201159  -9.16780993  2.91741449  -5.39697313  2.84290750
## X34.12  0.05572262  -1.15523027 -0.21900697  -0.36352454  0.50816045
## X35.12 -0.24468306   1.65211890  0.10224478  -0.06514144 -1.05060777
## X36.12 -2.98192838  -2.66558161 -2.20850465   7.82454293 -4.32589616
## X37.12  0.83783408  -4.91515072 -0.26451869  22.96561355  0.23448034
## X38.12 -0.15626022   2.24853077  1.96122110  -6.24656652 -0.22639458
## X39.12 -0.57105567   2.59710834 -1.15979885   1.51839089  0.54654159
## X40.12  2.91294533   8.53035309  0.34706342  -7.12559826  2.60972930
## X41.12  0.40244589   4.81496117 -1.86146118   5.24315207  0.74108782
## X42.12  0.68964376  -2.99859369  1.41276114   3.35738476  0.13089593
##            X31.12      X32.12       X33.12      X34.12      X35.12
## X1.12   1.00000000  1.00000000   1.00000000   1.0000000  1.00000000
## X2.12   0.08051319  0.91886721  -0.78570184  -3.4805778 -0.29150291
## X3.12  -1.71058934 -0.76424140   1.68584056   6.2143209 -2.91621684
## X4.12  -0.75589823  0.14471771   3.08107579 -11.0148882 -0.31599464
## X5.12   2.51244667  0.31622391  -0.39037736  -0.3467501  1.97708671
## X6.12  -7.90016949  0.05076225  -5.63273446 -22.5960708 -0.91163584
## X7.12   1.58795374 -0.11854327  -0.14406738  -3.2099138 -0.88993851
## X8.12   4.00461533  2.13230450   2.12830693  47.3920796  3.21839097
## X9.12  -1.56921395 -0.85151699  -0.13213660  -1.9983773  0.73494082
## X10.12 -7.42310972  0.23996856   4.76340892   1.9433764  2.37788165
## X11.12  5.59412385 -1.24143297   4.13341769   2.8584663 -1.78159615
## X12.12  0.85726841  0.59941088   2.45043253   1.1728639 -0.32209054
## X13.12  9.12733937  0.06681714   4.56101131  17.5239739 -0.28757034
## X14.12  1.65960269 -0.59701385   0.59648526  -7.1648018 -0.63642802
## X15.12  1.39742162  0.50770670 -13.93289332  19.8152370  2.82999449
## X16.12 -7.73106754  2.73139232  -6.55653908 -15.8842452  1.18811151
## X17.12 -2.71047200  0.19507916  -2.27832939 -28.0886892 -1.69390349
## X18.12 -1.65909149 -2.62486883   0.05090498   7.6987968  3.33445102
## X19.12 -0.18319311  0.01305882  -8.34288558 -31.2402363 -5.40425416
## X20.12 -3.96227703 -0.54094009  -4.79342531 -24.8593226  3.26829281
## X21.12  3.81464620 -1.43373337   4.59345211  17.6579463  2.97845342
## X22.12  1.75215834  0.03842829  -0.44657313  17.1921754  0.96650759
## X23.12 -9.60600115  0.29451649  -1.98339148 -22.8359898  1.44891038
## X24.12  4.99968567 -2.77734917  -0.65429837  -9.3986353  0.08346275
## X25.12  2.04226864  2.34844207  -8.80156737 -14.6791254  1.72837507
```

```
## X26.12  0.29555241 -1.47834605  -0.07584576  22.9331447 -3.65936719
## X27.12  3.46848477  0.63115860   5.89158959  18.3305608 -6.34550294
## X28.12 -0.28094218 -2.81031254 -11.69505211  26.6241970 -4.04301532
## X29.12 -0.63871738 -0.48420429   4.30528528  29.4627133  0.24716731
## X30.12  2.05430903  0.52656813   2.17996529   7.3369449  0.02087924
## X31.12 -1.17423845  1.37768078   0.67590225   0.4011562  1.17888301
## X32.12 -0.47662546  1.18957415   2.64087257 -32.4502054 -2.07308086
## X33.12 -1.18221046  1.38609418   2.43178629  42.0439314 -2.38885521
## X34.12  0.74813556  0.04655840   0.33056983  -7.3689671  0.11290712
## X35.12 -2.70694358 -0.25919729  -0.30490116  18.8694699  0.16098649
## X36.12  8.52586090  0.34182001   3.79139083   2.8873982  0.12285172
## X37.12  4.11718262 -1.74428035   2.11568371 -16.5007824 -1.46731051
## X38.12  9.14624329  1.87442483  -1.57487425  -8.7199446 -0.45034610
## X39.12  5.27329484 -0.12085308  -9.48601539   9.1403269 -2.79205215
## X40.12  2.63938255 -0.32712268  -2.20060544  44.0624744 -2.21827189
## X41.12 -1.59153380 -1.37216716   1.44788318 -29.3394882  2.82073413
## X42.12 -2.43972354  0.26158313  -1.38820910  -1.7543862 -1.10130000
##              X36.12       X37.12       X38.12      X39.12      X40.12
## X1.12   1.0000000000  1.000000000   1.00000000  1.00000000  1.00000000
## X2.12   0.0380276133  2.152851801   1.38308162  2.97931730  3.80662733
## X3.12  -0.1321618729  2.535418223  -3.41539810 -0.62544951 -2.54263511
## X4.12   0.2500413973  1.250372683  -0.46676813  0.49117165 -0.15539769
## X5.12   1.1197538715 -1.787269544   3.45431779 -0.53791825  3.33472445
## X6.12  -1.5974537172  0.064710913  -6.74420048 -0.71824752 -0.88299429
## X7.12  -0.2537689733 -0.693379102  -0.27451946 -0.82001609  2.16387700
## X8.12   1.5564071841 -2.015197832  -0.95179636 -0.01567590  2.37773674
## X9.12  -0.6053579208 -4.228554898   0.46611429 -0.50948316 -0.49369595
## X10.12 -0.4087841341 -0.747427941   1.31263478  1.50757530 -5.19711741
## X11.12 -2.2004924930 -5.003348602 -13.62194454  3.17230598 -6.53340751
## X12.12  0.9942576310 -1.135816392   2.44762975 -0.20239450 -2.21949499
## X13.12 -0.7311937086 -2.311060384   3.75532023 -0.68833361 -2.66522461
## X14.12  0.5393397520  1.379032400   2.77867789  0.41755925  2.46752033
## X15.12 -1.8240465945  0.770974173   1.68515802 -1.80400900 -3.11891038
## X16.12 -0.5016235862  4.385040258  -4.97668382 -0.16654167 -5.75843283
## X17.12 -1.4865456847 -2.650623166  -0.39433045  0.30876628  0.76613773
## X18.12 -0.9482507310 -0.619845039  -2.36874965  3.66387253 -0.89957789
## X19.12  0.9353755624  2.057886980   8.94453801  1.13999604  2.02252442
## X20.12  1.3114616197 -0.186456246   0.01987287  1.19386212  0.01371935
## X21.12 -1.5824336966  1.328157098  -6.36847734 -3.53921660  2.82919279
## X22.12 -0.0004698334  0.641921844  -0.35582036  1.90411019  1.23052617
## X23.12  3.2247877946 -3.976228328   1.64752869 -2.43308019  3.25527723
## X24.12  0.5800129668  0.377427690  -4.37229778 -0.84419718 -0.70208368
## X25.12 -0.7346973784  1.954795739   4.67840604  0.04677612  1.43205420
## X26.12 -1.4132605748 -4.834613889  -3.80665568 -1.01402688  3.10181913
## X27.12 -0.2654296156 -4.324829465  -2.89093090 -0.70060732 -7.47760170
## X28.12  1.9848389844 -0.388938004   5.50874188 -0.35311392 -1.52847757
## X29.12 -0.2944320967 -1.092760952   4.88476723 -0.87818873  0.80694138
## X30.12 -1.2611702910 -0.029650677  -1.65250675 -1.35095070  0.02406722
## X31.12  0.8106953064  1.729281783  -2.24567774  0.35210091  0.21264468
## X32.12 -2.6825187559 -3.095769157   5.97907087 -2.62657965  1.44611911
## X33.12  0.7800346747 -2.461050719  -1.24289057  0.77902648  3.60095330
## X34.12  0.0818596416 -0.006503914  -1.37990929  0.57247827 -1.01798527
## X35.12 -0.6411918115  1.055634380   2.83482626 -0.80255794 -1.83644969
## X36.12  0.6492619244  6.976109315   8.81147773 -3.84396597  9.14882999
```

```
## X37.12 -1.9770658213 -3.191396911   7.91656731  4.86329798  1.84533901
## X38.12  0.9210067509  2.376985890  -7.33765949 -5.62008663 -3.03421037
## X39.12  2.2507108124 -2.569432363  -5.51150365  1.81447491  2.11748432
## X40.12 -0.9953125189  4.622184636  -4.57909004 -1.38301958  0.69243230
## X41.12 -0.5358386520  0.593733287  -2.33984988 -2.43742140  2.09460880
## X42.12  0.0873118352 -0.488292191   0.78908285  0.25415787 -1.25231371
##             X41.12      X42.12
## X1.12   1.00000000  1.00000000
## X2.12  -2.89057546  0.00802237
## X3.12   1.25841847  0.33672239
## X4.12  -0.49996153  0.90773106
## X5.12  -2.16570940 -2.83647371
## X6.12  -0.18700311  1.09197493
## X7.12   0.42175783 -0.30334189
## X8.12  -4.49016658  2.01995598
## X9.12   2.22311347 -1.13411525
## X10.12 -3.61621177 -1.93464995
## X11.12 -4.25520108 -0.83713873
## X12.12  3.36535672 -0.24236276
## X13.12 -3.57383170 -0.86300688
## X14.12 -1.12657629  0.45618154
## X15.12  1.51646705  0.11816922
## X16.12 -0.01569408 -0.98393196
## X17.12  0.24688090  2.65322394
## X18.12 -4.08049292 -1.76233509
## X19.12 -5.30547607  5.75033718
## X20.12 -0.99062254 -1.09527851
## X21.12  6.47530365 -2.39405480
## X22.12  0.50528574  0.31192580
## X23.12  1.12752297  2.48696536
## X24.12 -2.53540220 -0.33900232
## X25.12 -3.54445827 -0.75068830
## X26.12  3.11720627  1.72348319
## X27.12  1.36748902 -1.88194122
## X28.12  3.18310445  0.02201815
## X29.12  0.52987237 -0.90546297
## X30.12 -0.66747227  0.37621398
## X31.12  2.36378358 -0.09728309
## X32.12 -4.64018204  0.99760921
## X33.12 -3.43004445  3.90057041
## X34.12 -0.70713725  1.06209359
## X35.12  2.14727964  1.01084645
## X36.12 -0.91657927 -2.61751540
## X37.12  1.12743459 -0.80258073
## X38.12 -8.99556051  0.58817001
## X39.12  4.74425652  1.14971366
## X40.12  3.55545564  2.31046427
## X41.12 -4.21975342 -1.19502970
## X42.12 -2.10923407 -1.20696852
##
## Weights W:
## (This is the loading matrix)
##
##              X1.12         X2.12         X3.12        X4.12         X5.12
```

```
## X1.d  -0.054769498 -0.0014245933  2.035652e-03 -0.076983417 -0.0056078111
## X2.d  -0.004237601  0.0084465077 -4.608662e-05 -0.026994325  0.0185211168
## X3.d  -0.049288897 -0.0132602168  1.628864e-03 -0.040118472  0.0213312099
## X4.d  -0.082362444  0.0832623328  8.077979e-03 -0.049939034  0.1081015852
## X5.d  -0.036515616 -0.0157159493  2.181828e-03 -0.015203765  0.0318652287
## X6.d  -0.021412271 -0.0051335551  2.041047e-03 -0.001021945 -0.0075282339
## X7.d  -0.038663027  0.0419372481  3.965924e-03  0.050395238  0.0437096074
## X8.d  -0.003132341  0.0137967533 -3.540611e-04  0.001091604 -0.0218640212
## X9.d  -0.074397112  0.0334997045  2.514184e-03 -0.108259116  0.0856470315
## X10.d -0.029960887  0.0048613463  1.778059e-04 -0.010095690  0.0129634412
## X11.d -0.007916916  0.0094444503  4.898232e-04 -0.015111156  0.0277447501
## X12.d -0.023800671 -0.0017793324  1.571217e-03 -0.052555117  0.0583847628
## X13.d -0.029136863  0.0133761148  1.703215e-04  0.021062298 -0.0155770863
## X14.d -0.049504839 -0.0005318973  3.659626e-03 -0.024105321  0.0343939372
## X15.d -0.012884082 -0.0021798773  1.513705e-03 -0.012163787  0.0164463722
## X16.d -0.005235847  0.0116148465  2.760319e-04 -0.040503192  0.0338997221
## X17.d -0.031220762  0.0147200831 -6.752988e-05 -0.036040129 -0.0098514039
## X18.d -0.013091151  0.0041992561  2.128721e-03 -0.028339043  0.0125849409
## X19.d -0.006423564  0.0121650462 -4.509612e-04  0.003444263  0.0286603515
## X20.d -0.021658139  0.0303985443  5.537037e-04  0.028819473  0.0224713649
## X21.d -0.021392147  0.0186556931 -1.019959e-03 -0.028082443  0.0381805033
## X22.d -0.026410497 -0.0002273676  1.883988e-03  0.024554879  0.0300561899
## X23.d  0.002936567 -0.0056913442 -5.051778e-04  0.009887706  0.0189430363
## X24.d -0.002451539 -0.0078340784 -6.336635e-04  0.033359986 -0.0119886981
## X25.d -0.006050548  0.0002700299  4.997300e-04  0.047630506  0.0168937332
## X26.d  0.004085878  0.0044897135  2.765529e-04  0.014011089 -0.0059348312
## X27.d  0.006642151  0.0053509020  6.683790e-04  0.042543845  0.0015761089
## X28.d -0.002356671  0.0094607575  4.891592e-05  0.020324176 -0.0206237710
## X29.d -0.005872141  0.0295343094  7.870802e-04  0.051475677  0.0033326991
## X30.d  0.010142178 -0.0318414056  8.346489e-04  0.081989424  0.0002175578
## X31.d -0.017202662  0.0270919928  1.156517e-03  0.131454373  0.0005120814
## X32.d -0.008956713  0.0002515707 -4.469486e-05  0.003067141 -0.0064743776
## X33.d -0.009564926  0.0011671377  2.261846e-03 -0.043494357  0.0406120590
## X34.d -0.112273959  0.0732847494 -6.583837e-04  0.059587362  0.2325172703
## X35.d -0.020138661  0.0324903254  3.956883e-03 -0.071203956  0.0422511385
## X36.d -0.011025628  0.0170186546  1.500921e-04 -0.013143248  0.0163031223
## X37.d -0.009755963  0.0088763139  9.831681e-04 -0.022022324  0.0288320618
## X38.d -0.001403067  0.0092598615  8.210380e-04 -0.042458449  0.0001864381
## X39.d -0.022282246  0.0100040517  1.701815e-03 -0.023813823  0.0362373123
## X40.d -0.020807982  0.0126660147  6.112034e-04 -0.021075861  0.0449212439
## X41.d -0.036184838  0.0227235227  2.838102e-03 -0.066411420  0.0614701169
## X42.d -0.056104650  0.0523152572  1.499199e-03 -0.072647671  0.1027137923
##             X6.12         X7.12         X8.12        X9.12        X10.12
## X1.d  -0.075105396  1.952774e-03 -0.0292657312  0.086529130 -3.289226e-03
## X2.d  -0.009729561  9.315800e-04  0.0115960704 -0.005303266 -2.613220e-03
## X3.d  -0.074824352 -4.765788e-04  0.0376128344  0.080822304  6.598764e-04
## X4.d  -0.087684879  8.648001e-04 -0.0234013297  0.066794352 -7.440228e-03
## X5.d  -0.059897687 -1.891788e-05  0.0279725504  0.019813554 -3.053164e-03
## X6.d  -0.029534649  1.366407e-04 -0.0400408167  0.013524317 -1.308389e-04
## X7.d  -0.138244235  3.464384e-03 -0.1827555624  0.064851336 -9.598773e-03
## X8.d  -0.026263458  7.134110e-04  0.0005572624  0.027534737 -7.571512e-04
## X9.d  -0.038920644 -3.621843e-04 -0.0343949601  0.011420761  3.939408e-03
## X10.d -0.026200932 -7.822000e-04 -0.0910740432 -0.034472258 -3.213185e-04
## X11.d -0.011360079  3.771946e-04  0.0101261505  0.027408601 -1.787364e-04
```

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## X12.d -0.029813522  1.877807e-03 -0.0226548170  0.015120450  4.213974e-04
## X13.d -0.077296245 -9.350757e-04 -0.0219036748 -0.007682215  3.087313e-03
## X14.d -0.076189771  7.652838e-05 -0.0418035848 -0.057295486  3.872353e-03
## X15.d -0.045898970  7.414092e-04 -0.0168537014 -0.003775262  2.727959e-04
## X16.d -0.028686376  5.231077e-05 -0.0273872951  0.003853528  1.125497e-04
## X17.d  0.014977493  3.780943e-05  0.0031874049 -0.004540841 -1.102250e-03
## X18.d -0.006586423 -2.828262e-04 -0.0245112635  0.007017415  2.242788e-03
## X19.d -0.026596246 -6.557472e-04 -0.0702528185  0.003694355  1.016330e-03
## X20.d -0.007082700 -3.166366e-04  0.0249910362  0.029235207  4.173216e-03
## X21.d -0.026862211 -6.929537e-04 -0.0054979536  0.005268967 -8.146524e-04
## X22.d -0.003039695  3.701224e-04 -0.0384882986  0.017122660 -2.606944e-03
## X23.d -0.016252770 -4.012961e-05  0.0134515845  0.003988031  7.126421e-04
## X24.d  0.071130364 -7.359254e-05 -0.0295133019  0.000434137 -1.378632e-03
## X25.d  0.066450854 -9.224583e-04  0.0326583104  0.015219610  4.415885e-05
## X26.d  0.004279542 -5.102681e-04  0.0351026644 -0.010049299  3.341757e-03
## X27.d  0.025322651  2.473671e-04  0.0068653204 -0.007661148 -1.195136e-03
## X28.d  0.008861402  2.346330e-04  0.0017510022  0.025258623  1.205521e-03
## X29.d  0.036513650 -6.855371e-04 -0.0264180530  0.013315645  5.998767e-05
## X30.d -0.004099251  3.110283e-04 -0.0349464044  0.003432973  4.409128e-03
## X31.d -0.026876923 -2.403200e-03 -0.0166755891 -0.045786171  6.524856e-03
## X32.d -0.014000602  1.511079e-04  0.0031730380  0.001028064 -1.031681e-03
## X33.d  0.009240653 -1.878536e-04  0.0151522852 -0.028984735  3.350325e-04
## X34.d  0.027475230  1.012954e-03  0.0217220821 -0.020367468 -1.879662e-03
## X35.d -0.023916354  1.037564e-03  0.0540030500  0.005890313 -7.404884e-03
## X36.d  0.001549720  1.659348e-04  0.0116232083 -0.007568398  3.058367e-03
## X37.d -0.033827659  3.476347e-05 -0.0076526716  0.006376437 -1.383601e-04
## X38.d  0.003368956 -4.258724e-04 -0.0085663131  0.006941632  1.129308e-04
## X39.d -0.054550636 -5.875332e-04  0.0030277655 -0.020130644 -3.957727e-03
## X40.d -0.008560027  6.122788e-05 -0.0404329683 -0.024364606  2.256391e-03
## X41.d -0.057174170  9.946175e-04 -0.0637725394 -0.005923339 -1.504018e-03
## X42.d -0.080827622  2.258209e-04  0.0306576473 -0.021531614 -1.353969e-03
##              X11.12        X12.12        X13.12       X14.12        X15.12
## X1.d  -1.668267e-02 -0.0002660134  0.0009002017 -0.065011302 -0.0338141782
## X2.d   1.509857e-02 -0.0011036764  0.0158583327 -0.054504958  0.0306282971
## X3.d   3.995796e-02 -0.0065172736 -0.0156936504 -0.043339843  0.0189908485
## X4.d  -2.366708e-02 -0.0030977605  0.0270654089  0.051399697  0.0352583635
## X5.d   1.703422e-03  0.0052924217  0.0020786762 -0.017007440  0.0325315811
## X6.d   1.257902e-02 -0.0020702156  0.0295352579  0.025204319  0.0399693424
## X7.d  -3.301891e-02  0.0082143406 -0.0157562547  0.073221649  0.0106975843
## X8.d   1.409259e-02 -0.0041297202  0.0136564458  0.032412778  0.0135097473
## X9.d  -4.509113e-02 -0.0026544927  0.0743849776 -0.023529799  0.0127061321
## X10.d  3.041084e-02  0.0010267555  0.0023047000  0.012817945  0.0845669666
## X11.d -8.649943e-03  0.0049102108 -0.0071363208  0.032045145  0.0518819428
## X12.d  3.981939e-02 -0.0055404791 -0.0045038249  0.065722364  0.0388924649
## X13.d -6.602182e-03 -0.0054944777 -0.0223581816 -0.041024285  0.0117931756
## X14.d  2.808357e-03  0.0007591033 -0.0034931880  0.054221543  0.0241760551
## X15.d  1.017635e-02  0.0031802952  0.0091923546 -0.011303565 -0.0013901216
## X16.d -2.719600e-02 -0.0018331344 -0.0167024623  0.011764192 -0.0035659977
## X17.d -1.395178e-02 -0.0056051291  0.0051325896  0.018883289  0.0269380220
## X18.d -2.542522e-02 -0.0080187402  0.0077957875  0.015552022 -0.0254935380
## X19.d -1.712609e-02 -0.0023044250  0.0159526532 -0.018358913  0.0738782157
## X20.d -7.680122e-06 -0.0025027399  0.0222485156 -0.026840517  0.0349538373
## X21.d -7.408734e-03 -0.0075019318  0.0294941417 -0.008828514  0.0450641224
## X22.d  5.553872e-03 -0.0076766906 -0.0189557014 -0.026974114 -0.0297789753
```

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## X23.d  3.263892e-03  0.0021871871 -0.0309234428  0.019421647 -0.0171224640
## X24.d -2.406083e-03  0.0003002521 -0.0277388209  0.007283625 -0.0034581339
## X25.d  5.949551e-03  0.0015520256 -0.0020646842  0.053046527  0.0255451659
## X26.d  7.281803e-02  0.0008521542 -0.0203349353 -0.012227875  0.0182595723
## X27.d -4.202118e-03 -0.0027108640  0.0119576137  0.005844768  0.0044202603
## X28.d  1.086282e-02 -0.0020613234 -0.0192946091 -0.004169232  0.0024983389
## X29.d -4.009616e-02  0.0045200840  0.0052222496 -0.011675214  0.0420970084
## X30.d -5.102953e-02 -0.0014597459 -0.0175221281 -0.010654045  0.0216707581
## X31.d  2.309333e-02  0.0052735628 -0.0292556669 -0.022472653  0.0428481948
## X32.d  7.555795e-04 -0.0014385714 -0.0036925336  0.004375144 -0.0369838125
## X33.d -2.585449e-02 -0.0042732574 -0.0016497210 -0.012063372 -0.0079674630
## X34.d -1.972401e-02 -0.0146346378  0.0662203441 -0.037928154 -0.0619253205
## X35.d -9.430101e-02 -0.0076037063  0.0278354706  0.015464880  0.0294983500
## X36.d -2.080698e-02 -0.0012092708  0.0175385555 -0.016536449  0.0206129811
## X37.d  2.348099e-02 -0.0007689238  0.0022496163  0.032858677  0.0156525132
## X38.d  3.163741e-02  0.0026255421  0.0107161264 -0.010462972 -0.0008558277
## X39.d -3.575957e-02 -0.0031571015  0.0339277894 -0.001200762  0.0450529349
## X40.d -1.455643e-02  0.0024296750 -0.0015057189  0.028609149  0.0279990569
## X41.d -5.501824e-03 -0.0065033683 -0.0366488736 -0.027843578  0.0886763967
## X42.d -8.481700e-02 -0.0134828538  0.0467964394  0.055614519  0.0123905396
##             X16.12       X17.12        X18.12        X19.12        X20.12
## X1.d  -0.162988030 -0.016288859 -2.564870e-03  0.0145348712  6.552780e-04
## X2.d  -0.078763450  0.025620600  1.104638e-02 -0.0422989378 -5.557948e-06
## X3.d  -0.111663714 -0.028279828 -3.328249e-03 -0.0115265948  8.459365e-04
## X4.d   0.020484105  0.035583898  1.677119e-03 -0.0755772227  3.745912e-04
## X5.d  -0.041313890  0.009656724 -6.157117e-03 -0.0058585820  7.221850e-04
## X6.d  -0.080664955 -0.025361144  3.415660e-04 -0.0053693964  5.273411e-04
## X7.d  -0.026600198 -0.020430752  2.071494e-02 -0.0082388576  2.151897e-03
## X8.d   0.048167013 -0.008787655  3.493002e-03 -0.0092243931  5.426188e-04
## X9.d  -0.018049377  0.028199467  5.285825e-03 -0.0693849428  4.958870e-04
## X10.d  0.073288110  0.005664948  7.021732e-04  0.0037276933 -5.610357e-04
## X11.d -0.103307320 -0.002751855  1.796838e-03 -0.0028823381 -3.197964e-04
## X12.d  0.016880674 -0.033167170  1.847145e-02  0.0032539659  3.570502e-04
## X13.d -0.038294271  0.003201584  2.096007e-03 -0.0148224504  1.064417e-03
## X14.d  0.013570707 -0.021498851  2.761016e-03 -0.1295957919  9.525431e-04
## X15.d -0.046207946  0.006680086 -5.206797e-03  0.0002597553  3.143824e-05
## X16.d  0.092919971 -0.010505140 -3.982212e-03 -0.0187446651  4.487022e-04
## X17.d  0.017749892  0.021705690 -7.788587e-03 -0.0225805675  2.202155e-04
## X18.d -0.038767334  0.027129510 -1.076402e-03  0.0113259874  7.628014e-04
## X19.d -0.023918307  0.018205039 -9.741528e-04 -0.0141084675  4.921293e-04
## X20.d -0.053334121 -0.029916399  7.532164e-03  0.0073097236  1.783399e-04
## X21.d -0.017282390  0.007829270 -1.439929e-03 -0.0204400409  7.338017e-05
## X22.d -0.105554118 -0.047483883 -4.533641e-03 -0.0147798176 -2.333731e-04
## X23.d -0.066469743  0.009535216 -4.898939e-03  0.0102320564  1.053424e-04
## X24.d -0.058576765  0.013441351  3.294295e-03 -0.0049651706  5.536596e-05
## X25.d  0.013728541  0.020041495  4.336628e-03 -0.0154917527  9.718032e-05
## X26.d  0.016689626 -0.002582374  2.141464e-03 -0.0239305137  3.197213e-04
## X27.d -0.016847787  0.012401872 -2.714610e-03 -0.0078307115  6.455682e-04
## X28.d  0.010838083  0.033215046  2.316159e-03  0.0071588009 -4.049120e-04
## X29.d -0.022015445 -0.005048192 -1.277851e-02 -0.0057265113 -1.026803e-03
## X30.d  0.047607050  0.019387866 -4.738312e-04 -0.0148206440 -1.018250e-03
## X31.d -0.041544867  0.159423374  2.670754e-03  0.0328808931 -7.438858e-04
## X32.d -0.044264003 -0.004334300  2.990307e-03  0.0194017208 -5.492920e-04
## X33.d  0.018303671  0.004127528  2.109642e-03  0.0152344573 -1.442049e-04
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## X34.d  0.084522120  0.014008557  8.447954e-03  0.0665670807 -3.737054e-04
## X35.d -0.166950555 -0.009236585  2.009290e-02  0.0042881191  3.233415e-04
## X36.d  0.005910211 -0.003080300 -5.992187e-05  0.0242780988 -5.510533e-05
## X37.d  0.014557108  0.002565534 -1.373690e-03  0.0134307137 -3.630614e-04
## X38.d -0.017558300 -0.003461313  5.443282e-04  0.0007098213 -8.177267e-04
## X39.d  0.030808675 -0.024477716  3.868382e-04  0.0026259649 -5.445528e-04
## X40.d -0.009622136  0.005205478  2.323890e-03  0.0098753113  1.820428e-04
## X41.d -0.011244959 -0.015702889 -1.426037e-03 -0.0080480635  1.995834e-04
## X42.d -0.202865658 -0.014064909 -9.145341e-03 -0.0352719717 -9.681121e-04
##             X21.12        X22.12        X23.12        X24.12        X25.12
## X1.d  -0.148097282 -6.049095e-02  8.613327e-04 -0.0105137265 -0.0146668952
## X2.d   0.045865576 -1.011345e-02  1.776990e-03  0.0039180314 -0.0040992374
## X3.d  -0.020867190  3.117972e-02 -7.782745e-04 -0.0041302142 -0.0030391297
## X4.d  -0.075106241 -4.377198e-02 -2.360906e-03 -0.0035161225  0.0548177260
## X5.d  -0.028260931  2.818366e-02 -5.788460e-04  0.0198991164  0.0084235922
## X6.d  -0.008781307  1.713910e-02  2.159484e-03 -0.0041912633  0.0080196247
## X7.d   0.064693795 -2.661148e-02  2.656001e-03  0.0405827421 -0.0203040818
## X8.d  -0.020823471 -4.712748e-03 -2.196443e-04  0.0068643132 -0.0003847480
## X9.d  -0.156844797 -2.067932e-02 -1.755862e-03  0.0249560018  0.0106016563
## X10.d -0.064866992 -2.665340e-02 -1.016330e-03 -0.0007443714  0.0048608803
## X11.d -0.006017553 -1.097893e-03  1.771234e-04 -0.0150320040 -0.0005790339
## X12.d  0.004994646 -5.332455e-03  5.645446e-04  0.0167855267  0.0157976983
## X13.d  0.045927202  2.815938e-02  2.066325e-04 -0.0079904082  0.0048973147
## X14.d -0.046343989  4.319544e-02  1.286045e-04 -0.0079062771 -0.0020988149
## X15.d  0.021659939  1.154945e-02 -4.835608e-04 -0.0081602382  0.0059132793
## X16.d -0.033910068  7.202907e-05 -3.304136e-04  0.0005633662 -0.0012056394
## X17.d -0.023255996  2.179890e-02 -7.077238e-04  0.0101817990  0.0012065605
## X18.d  0.031374426 -1.525051e-02  7.177409e-05 -0.0003808053 -0.0061552754
## X19.d -0.001915532  1.681835e-03 -1.431342e-03 -0.0024967400  0.0023012340
## X20.d -0.005789348  3.327520e-02 -1.039026e-03  0.0006443653 -0.0058876726
## X21.d -0.040009699  2.292498e-02 -1.020816e-03 -0.0177859878 -0.0067352817
## X22.d -0.103499037  2.590188e-02  1.284781e-05  0.0172212036  0.0243920640
## X23.d -0.009110450  3.234607e-04  1.325338e-03 -0.0058187700 -0.0023077772
## X24.d  0.019524492 -1.723221e-03 -9.531036e-04 -0.0062390185 -0.0028105531
## X25.d -0.009656441 -1.691827e-02 -1.959405e-04 -0.0020734038  0.0008265182
## X26.d  0.003807440 -2.528961e-02 -1.563471e-03  0.0026735939 -0.0022077597
## X27.d -0.035612160  1.793943e-02  1.371439e-04 -0.0010064205  0.0012634689
## X28.d -0.017026484  4.304663e-03  2.275958e-04 -0.0126429632 -0.0003392038
## X29.d  0.048099193  3.011426e-04  3.158125e-04  0.0018534863 -0.0172459281
## X30.d  0.005818354  8.939863e-03  1.134748e-03  0.0037143282 -0.0056997158
## X31.d  0.075987732  4.288130e-02 -5.140413e-03  0.0177910758 -0.0057675230
## X32.d -0.021578048 -8.724902e-03 -1.248892e-03 -0.0213878546 -0.0084073753
## X33.d  0.018448441  1.821563e-02 -8.630907e-04 -0.0085052870  0.0076937657
## X34.d -0.157501872  1.781744e-02  6.220019e-04  0.0355033212 -0.0197893439
## X35.d -0.024477870  3.651501e-02 -7.250228e-04  0.0085834510 -0.0169039364
## X36.d -0.044433331 -1.899094e-02  3.973930e-04 -0.0023177206  0.0037364102
## X37.d -0.039051087  2.233389e-02  4.726708e-04 -0.0081259931 -0.0073177229
## X38.d -0.027831867  1.416668e-02  9.831784e-04  0.0042332974 -0.0103240616
## X39.d -0.025784491 -1.663048e-02 -1.529817e-03  0.0002404709 -0.0058951764
## X40.d -0.027235749  7.530571e-03 -1.997412e-04  0.0107186697  0.0097107210
## X41.d -0.044016165 -5.000157e-03 -1.918215e-03  0.0180162877  0.0159865489
## X42.d -0.064887039 -3.122532e-02 -1.975438e-03  0.0292900198  0.0171995401
##             X26.12        X27.12        X28.12        X29.12
## X1.d  -0.1523158422  0.0020286853 -0.0430603358  0.0007215286
```

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## X2.d  -0.0213068023 -0.0074196734 -0.0032296016 -0.0041720690
## X3.d   0.1198306516 -0.0064600273 -0.0477668460 -0.0036707537
## X4.d  -0.1285178913  0.0045371962 -0.0250702777 -0.0109108540
## X5.d  -0.0036878303  0.0115372100  0.0007583956  0.0111167021
## X6.d   0.0169276418  0.0120954735  0.0218712158  0.0031545006
## X7.d   0.1511688844  0.0025922511 -0.0530633050  0.0103030996
## X8.d  -0.0055067071  0.0016086881  0.0322060555 -0.0018857544
## X9.d   0.0340146436 -0.0036641246 -0.0205078600 -0.0199233202
## X10.d  0.0194797222 -0.0016421341 -0.0302967677 -0.0035522427
## X11.d  0.0023170196 -0.0005318674  0.0107120813  0.0004954611
## X12.d  0.0350732781 -0.0006385963  0.0265546063  0.0049908452
## X13.d -0.0348898927  0.0030570203 -0.0310667803 -0.0072336094
## X14.d  0.0774503136  0.0040541544 -0.0532452240 -0.0041998713
## X15.d  0.0019068326 -0.0059891047 -0.0263097884 -0.0025077514
## X16.d -0.0219848284  0.0047210307 -0.0002945348 -0.0070775559
## X17.d -0.0146436402 -0.0032097790 -0.0229101829  0.0009554673
## X18.d -0.0233033441 -0.0080505627  0.0034296778  0.0009062380
## X19.d  0.0030153838  0.0037216165 -0.0082283109 -0.0017891645
## X20.d -0.0596283848  0.0038680564 -0.0621577390  0.0017397254
## X21.d -0.0514644990  0.0050640038 -0.0355730755  0.0007182830
## X22.d  0.1810852481  0.0024442199 -0.0140723747  0.0076464936
## X23.d -0.0110714502 -0.0042567205  0.0083082339 -0.0003819358
## X24.d -0.0024646572  0.0055147572  0.0168965991 -0.0055445359
## X25.d -0.0212434584 -0.0032627709  0.0034659477 -0.0026179361
## X26.d  0.0003726015  0.0085114106 -0.0239745038  0.0012970436
## X27.d -0.0117860084 -0.0059360177 -0.0055589554 -0.0017829977
## X28.d -0.0094925784  0.0032883847  0.0082657898  0.0031109397
## X29.d -0.0270078113  0.0029504926  0.0481590284  0.0073670506
## X30.d -0.0213242482  0.0012382990 -0.0005469767 -0.0026988539
## X31.d  0.0199481641 -0.0030090161  0.0557145963 -0.0095866739
## X32.d -0.0017982472 -0.0074614762  0.0235770561  0.0010999867
## X33.d -0.0112385099  0.0007852178 -0.0339354295 -0.0050646577
## X34.d -0.0179471553  0.0383746318  0.0043435733  0.0082323578
## X35.d  0.0137979113  0.0117320378 -0.0031244233 -0.0028289524
## X36.d  0.0205186309  0.0031257250 -0.0120850701 -0.0045709835
## X37.d -0.0345457839  0.0030514695 -0.0004148846 -0.0109673512
## X38.d  0.0365662387 -0.0023222529 -0.0092739349 -0.0008694920
## X39.d -0.0065649068 -0.0045744700  0.0099807581 -0.0079254344
## X40.d -0.0807698454 -0.0073254210  0.0097032157  0.0007575503
## X41.d -0.0439697789 -0.0076047016 -0.0145178647 -0.0101371668
## X42.d -0.0889444517  0.0074496719 -0.0426712764 -0.0078018351
##             X30.12        X31.12        X32.12        X33.12
## X1.d  -0.0340974566 -0.0132563454 -6.440724e-02 -0.0204781493
## X2.d   0.0267067685  0.0076336030 -9.156088e-03  0.0015248022
## X3.d  -0.0009210521  0.0078458947  1.623660e-02 -0.0067628594
## X4.d   0.0800933140  0.0008246831  2.433900e-02 -0.0118588359
## X5.d   0.0568826730  0.0024879873  2.479220e-03  0.0042017382
## X6.d   0.0062006232  0.0110530699 -1.742552e-02 -0.0009663370
## X7.d  -0.0456140327 -0.0045393789 -5.449639e-03 -0.0127511605
## X8.d   0.0083795136 -0.0006249201 -1.592491e-02  0.0038778904
## X9.d   0.0325276661  0.0015782080 -5.830407e-03  0.0027337626
## X10.d  0.0172443570  0.0033755647 -1.424685e-02 -0.0036363148
## X11.d -0.0149521335  0.0007613513 -1.341155e-03 -0.0061909565
## X12.d  0.0318311859 -0.0098917522 -5.524400e-02 -0.0135469586
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## X13.d  0.0118112116 -0.0069949750 -1.560589e-02 -0.0013169904
## X14.d  0.0176297009 -0.0005715935  4.269731e-02 -0.0074994552
## X15.d -0.0009128040 -0.0097994745 -4.530736e-03  0.0079065436
## X16.d  0.0241172362  0.0008025702 -3.292331e-02  0.0021502843
## X17.d  0.0098151301  0.0011980240 -5.778449e-03  0.0027361847
## X18.d  0.0136165250 -0.0003676775  1.396533e-02  0.0045390238
## X19.d  0.0165532649  0.0017552247 -2.374672e-02  0.0047341208
## X20.d  0.0146994877  0.0096696207 -4.014758e-03  0.0008316167
## X21.d  0.0238800822 -0.0014121724 -6.386252e-03 -0.0031483026
## X22.d  0.0321945611 -0.0107164731 -2.848196e-02  0.0053761712
## X23.d  0.0008086770  0.0028933063 -5.480950e-03  0.0006964906
## X24.d  0.0105020021 -0.0037336500 -3.121172e-03  0.0020541701
## X25.d -0.0224397492 -0.0059476955 -2.198191e-02  0.0049109089
## X26.d  0.0061599207 -0.0010456559 -1.318301e-02 -0.0038926405
## X27.d -0.0050306801 -0.0009629622 -1.163191e-02 -0.0010706536
## X28.d -0.0036984812 -0.0003938470  2.993329e-02  0.0063848787
## X29.d -0.0315088088 -0.0017628237  2.122403e-02 -0.0084685286
## X30.d  0.0129625000 -0.0017903700 -3.677025e-03  0.0021137143
## X31.d -0.0155087462  0.0085594848 -2.957248e-02  0.0024890107
## X32.d  0.0111140488  0.0024857406 -8.001822e-03  0.0020537264
## X33.d  0.0031423986  0.0063634021 -8.322206e-03 -0.0053235333
## X34.d -0.0170112470 -0.0113490086  3.447106e-02 -0.0143237048
## X35.d  0.0131313930  0.0095187889  1.144921e-02 -0.0063103199
## X36.d  0.0181346712 -0.0012546267 -1.079110e-02 -0.0012564405
## X37.d  0.0157323421 -0.0054382195 -8.597013e-03 -0.0020100082
## X38.d  0.0003531029 -0.0047630008 -1.459157e-02 -0.0005889936
## X39.d  0.0208818540 -0.0022044955  1.888412e-05  0.0128015448
## X40.d  0.0107360634 -0.0008344864  1.149641e-03  0.0052793381
## X41.d -0.0035590047  0.0062637660  2.019315e-02 -0.0030429073
## X42.d  0.0250485814  0.0041189893 -2.350227e-02  0.0108407703
##              X34.12        X35.12        X36.12        X37.12
## X1.d  -1.088692e-03  0.0268696894 -0.0325895956 -0.0163004324
## X2.d  -1.810331e-03 -0.0013949549  0.0126883701 -0.0030936026
## X3.d  -2.520636e-03  0.0354385617  0.0040402408 -0.0358540125
## X4.d  -5.252742e-04  0.0020967347 -0.0353418412 -0.0174507333
## X5.d  -8.885053e-04  0.0053287508  0.0085613265 -0.0099372657
## X6.d  -1.837510e-04 -0.0006758151  0.0228129153 -0.0047316936
## X7.d  -1.698288e-03  0.0063395204  0.0762072579  0.0045007969
## X8.d  -2.119767e-03 -0.0128916942 -0.0015023897 -0.0028285147
## X9.d  -2.511141e-03  0.0134234862 -0.0114602608  0.0215628201
## X10.d -2.586769e-03 -0.0035161435 -0.0061611846  0.0079036810
## X11.d  2.555444e-04  0.0047384115 -0.0023209782  0.0008478427
## X12.d -1.310399e-04  0.0209608356 -0.0336691970  0.0014924190
## X13.d -4.901446e-04  0.0060583683  0.0111847834  0.0014547389
## X14.d -1.062114e-03 -0.0062110273 -0.0261846905 -0.0255952036
## X15.d -9.023869e-04 -0.0106575276  0.0143115356 -0.0074938552
## X16.d -6.245848e-04  0.0054851294 -0.0049510736 -0.0005131658
## X17.d  6.464670e-04  0.0097779802  0.0084649713 -0.0012144758
## X18.d -6.375172e-04  0.0057500033  0.0036631727  0.0004261368
## X19.d  2.199086e-04  0.0109024439 -0.0172535767  0.0017383462
## X20.d -1.147701e-03 -0.0075990108 -0.0364530339  0.0044280345
## X21.d -2.064338e-03 -0.0108162139 -0.0207918631 -0.0057411688
## X22.d -1.369042e-03 -0.0245882200  0.0378139449 -0.0044700056
## X23.d -4.519237e-04 -0.0016280288 -0.0077959709  0.0025811379
```

```
## X24.d -5.690960e-04 -0.0041312651 -0.0062158344  0.0010366170
## X25.d  3.383079e-04 -0.0064117729  0.0052891407 -0.0007885656
## X26.d -2.674623e-04  0.0048509667  0.0233224246  0.0038464021
## X27.d -4.951196e-04  0.0038363763 -0.0003016734  0.0021018847
## X28.d -5.062132e-04  0.0105734819 -0.0169769155  0.0010049555
## X29.d -2.290531e-03  0.0078914286 -0.0154738951 -0.0002610410
## X30.d -8.623334e-04 -0.0004207353 -0.0001374143 -0.0038619582
## X31.d -8.735212e-05 -0.0179635019  0.0160929669 -0.0175325641
## X32.d  2.342081e-04  0.0062022291  0.0222536186 -0.0006622592
## X33.d -2.701196e-03  0.0071998415 -0.0221055815  0.0091990830
## X34.d -2.925226e-03 -0.0108907896  0.0491339944 -0.0040968591
## X35.d -1.325142e-03 -0.0203044315  0.0551896923 -0.0057421823
## X36.d -2.536334e-04  0.0042710717  0.0037930647 -0.0008557060
## X37.d -4.476683e-04  0.0033389344 -0.0015515858  0.0024360336
## X38.d -9.439289e-05 -0.0025215833 -0.0167232074 -0.0035279843
## X39.d -6.158817e-04  0.0045041042 -0.0184893423  0.0013948253
## X40.d -1.311442e-03  0.0137837412  0.0093885407 -0.0051891120
## X41.d  1.082635e-04 -0.0080925061 -0.0207962531  0.0013591006
## X42.d -2.744967e-03  0.0252173404 -0.0176759905 -0.0029466169
##             X38.l2        X39.l2        X40.l2        X41.l2
## X1.d   2.587330e-03 -9.665779e-03 -0.0166364767  3.947587e-03
## X2.d   3.925909e-03 -1.864448e-02 -0.0052746335  3.059975e-03
## X3.d   1.609782e-03  7.079241e-03 -0.0119325892  5.844153e-03
## X4.d   1.216057e-02  4.485569e-02 -0.0133343994  1.573044e-03
## X5.d   5.537590e-04  9.567080e-03 -0.0028670157  6.544851e-03
## X6.d   9.208233e-03  5.312157e-03 -0.0011727501  7.700393e-04
## X7.d   1.163975e-02  2.721618e-03 -0.0184934300 -1.154841e-02
## X8.d   4.231912e-03 -8.987286e-05 -0.0025768234  4.213121e-03
## X9.d   9.170342e-03  2.218986e-02 -0.0088249371  1.386416e-03
## X10.d  4.873451e-04 -1.029822e-03 -0.0004485827  9.295659e-05
## X11.d  8.719267e-03 -7.811449e-03  0.0003076163  3.078295e-03
## X12.d  1.738870e-03  3.732741e-03  0.0094770582 -3.682699e-03
## X13.d  4.621551e-03  4.688679e-03 -0.0017474436  3.605499e-03
## X14.d  1.001284e-03  5.061999e-03 -0.0011188776  7.060273e-03
## X15.d -1.122002e-03  4.182186e-03  0.0072355310  6.195668e-04
## X16.d  3.236852e-03 -2.356155e-03  0.0001994403  1.325190e-04
## X17.d  6.867413e-03  7.915121e-04 -0.0116476768  1.078418e-03
## X18.d  6.932384e-03 -2.115087e-03 -0.0008193715  3.895386e-03
## X19.d -1.018876e-03  1.426082e-03 -0.0058946681  2.758045e-03
## X20.d  4.047702e-03  1.029948e-02 -0.0034788772  3.996402e-03
## X21.d  2.589573e-03  1.637330e-02 -0.0108065807 -2.558248e-04
## X22.d -3.551517e-03 -2.829667e-02 -0.0125004217 -6.575796e-03
## X23.d -1.328540e-03 -2.149657e-03  0.0010897403 -1.249553e-03
## X24.d  1.454793e-03  6.357545e-03 -0.0016051037 -5.224729e-04
## X25.d -4.367779e-03  6.851959e-03 -0.0048126876  1.563356e-04
## X26.d  4.160515e-03  3.100964e-03 -0.0038945136 -7.802673e-05
## X27.d -3.741536e-05  3.173662e-03  0.0028780728  1.512373e-03
## X28.d  6.628378e-04  5.550703e-03  0.0014425733  6.007101e-06
## X29.d -7.555105e-03 -1.906669e-03  0.0039727870 -1.141394e-05
## X30.d  1.781374e-03  6.453383e-03 -0.0024758765  1.976368e-03
## X31.d  1.155815e-02  2.016635e-03 -0.0049383613 -6.299575e-03
## X32.d -2.514473e-03  1.084708e-02 -0.0023103155  3.971404e-03
## X33.d  5.056706e-04  1.079869e-02 -0.0084393140  4.643365e-03
## X34.d  1.112158e-02  6.164141e-03  0.0243367610  1.216529e-02
```

```
## X35.d -6.080715e-03  9.320672e-04  0.0125472885  2.277496e-03
## X36.d  4.170855e-03  4.972484e-03 -0.0016555175  3.055009e-04
## X37.d -2.401312e-03 -8.647113e-03 -0.0050924023 -1.226549e-03
## X38.d  2.420339e-03  5.669663e-03  0.0006252790  2.041338e-03
## X39.d  6.419142e-03  7.353515e-03  0.0004657518 -1.019663e-03
## X40.d  9.465854e-04  2.512767e-03 -0.0044625101 -2.895771e-03
## X41.d  3.576587e-03  2.239716e-02 -0.0114493839  6.073691e-03
## X42.d  4.139465e-03  1.713847e-02 -0.0089791496  5.969223e-03
##              X42.l2
## X1.d  -0.0050735045
## X2.d  -0.0003051018
## X3.d  -0.0058778331
## X4.d  -0.0289508674
## X5.d   0.0006008005
## X6.d  -0.0050038942
## X7.d   0.0005796437
## X8.d  -0.0051705129
## X9.d  -0.0157030147
## X10.d -0.0031411099
## X11.d  0.0009894563
## X12.d -0.0059564445
## X13.d -0.0027111509
## X14.d -0.0057565019
## X15.d -0.0016807176
## X16.d  0.0018713030
## X17.d -0.0125602746
## X18.d -0.0004803149
## X19.d -0.0052768221
## X20.d -0.0072754820
## X21.d -0.0051109014
## X22.d -0.0034735778
## X23.d -0.0042494164
## X24.d  0.0015872154
## X25.d  0.0024770608
## X26.d -0.0014908484
## X27.d  0.0014687421
## X28.d  0.0027735002
## X29.d  0.0006042300
## X30.d -0.0011563895
## X31.d  0.0098582425
## X32.d  0.0018399520
## X33.d -0.0064916566
## X34.d -0.0503207277
## X35.d -0.0183004557
## X36.d -0.0028078496
## X37.d -0.0057808626
## X38.d -0.0041488797
## X39.d -0.0067610820
## X40.d -0.0046513486
## X41.d -0.0072878768
## X42.d -0.0056056822
```

```
library(BigVAR)
Y = data.matrix(t(train))
```

```
model = constructModel(Y, p = 2, struct = "Basic", gran = c(25,10), T1 = 81, T2 = 162)
var_model <- cv.BigVAR(model)
```

```
## Cross-Validation Stage: Basic
  |
  |                                                                      |   0%
  |
  |=                                                                     |   1%
  |
  |==                                                                    |   2%
  |
  |==                                                                    |   4%
  |
  |===                                                                   |   5%
  |
  |====                                                                  |   6%
  |
  |=====                                                                 |   7%
  |
  |======                                                                |   9%
  |
  |======                                                                |  10%
  |
  |=======                                                               |  11%
  |
  |========                                                              |  12%
  |
  |=========                                                             |  14%
  |
  |==========                                                            |  15%
  |
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```
var_model
```

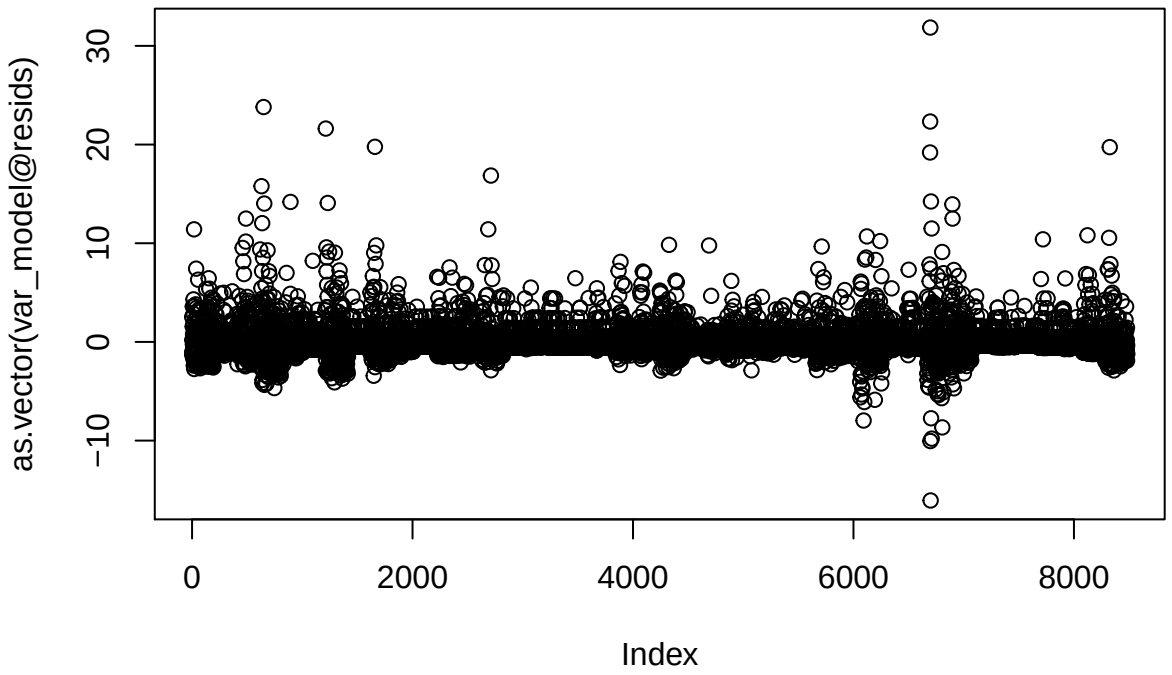
```
## *** BIGVAR MODEL Results ***
## Structure
## [1] "Basic"
## Forecast Horizon
## [1] 1
## Minnesota VAR
## [1] FALSE
## Maximum Lag Order
## [1] 2
## Optimal Lambda
## [1] 186.4985
## Grid Depth
## [1] 25
## Index of Optimal Lambda
## [1] 10
```

```
## In-Sample MSFE
## [1] 97.646
## BigVAR Out of Sample MSFE
## [1] 54.577
## *** Benchmark Results ***
## Conditional Mean Out of Sample MSFE
## [1] 67.835
## AIC Out of Sample MSFE
## [1] 111.178
## BIC Out of Sample MSFE
## [1] 67.833
## RW Out of Sample MSFE
## [1] 93.905
```

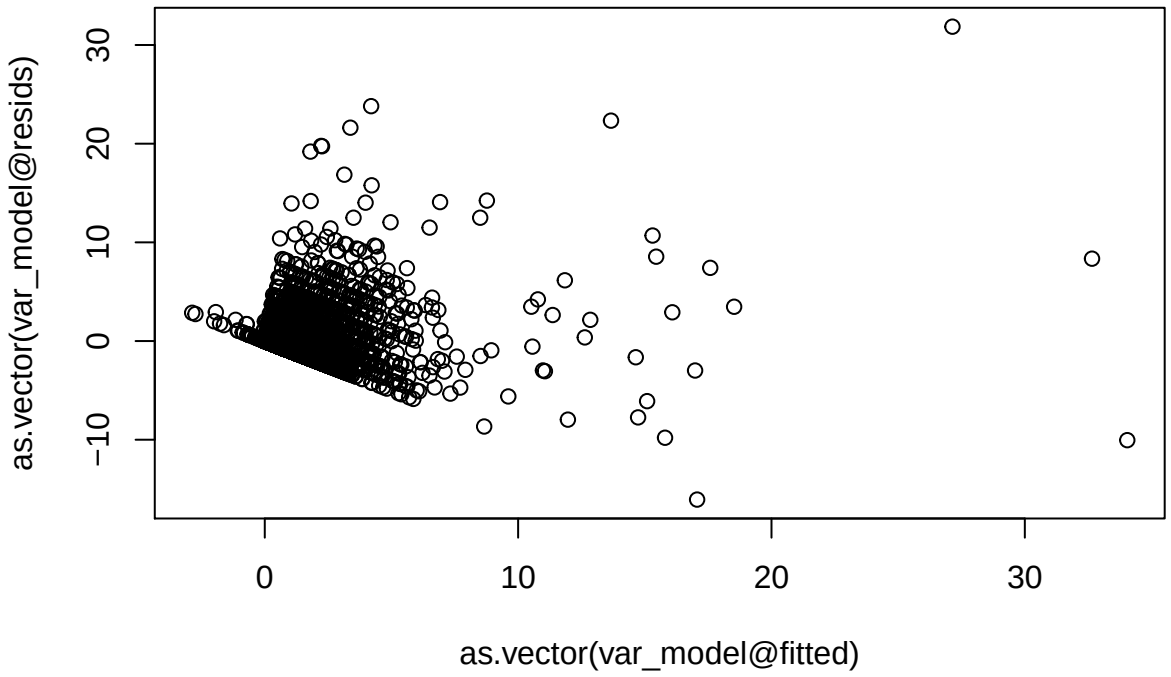
```
var_model@crossval
```

```
## [1] "Rolling"
```

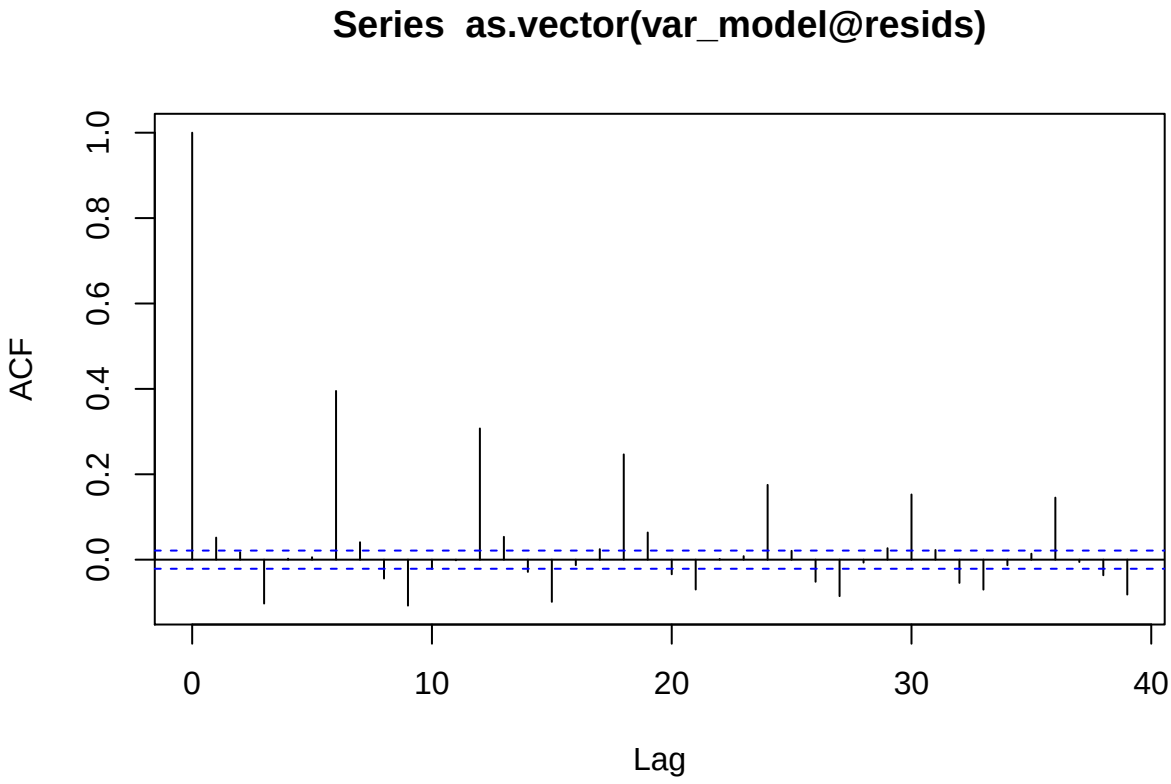
```
plot(as.vector(var_model@resids))
```



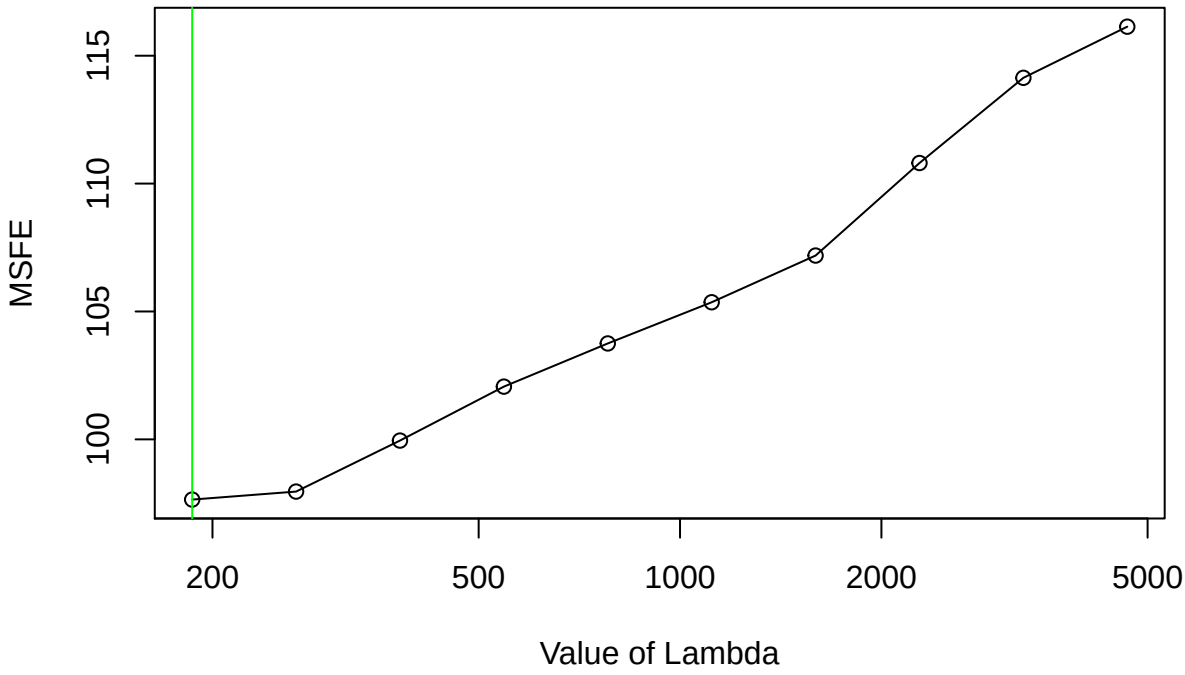

```
plot(as.vector(var_model@fitted),as.vector(var_model@resids))
```




```
acf(as.vector(var_model@resids))
```

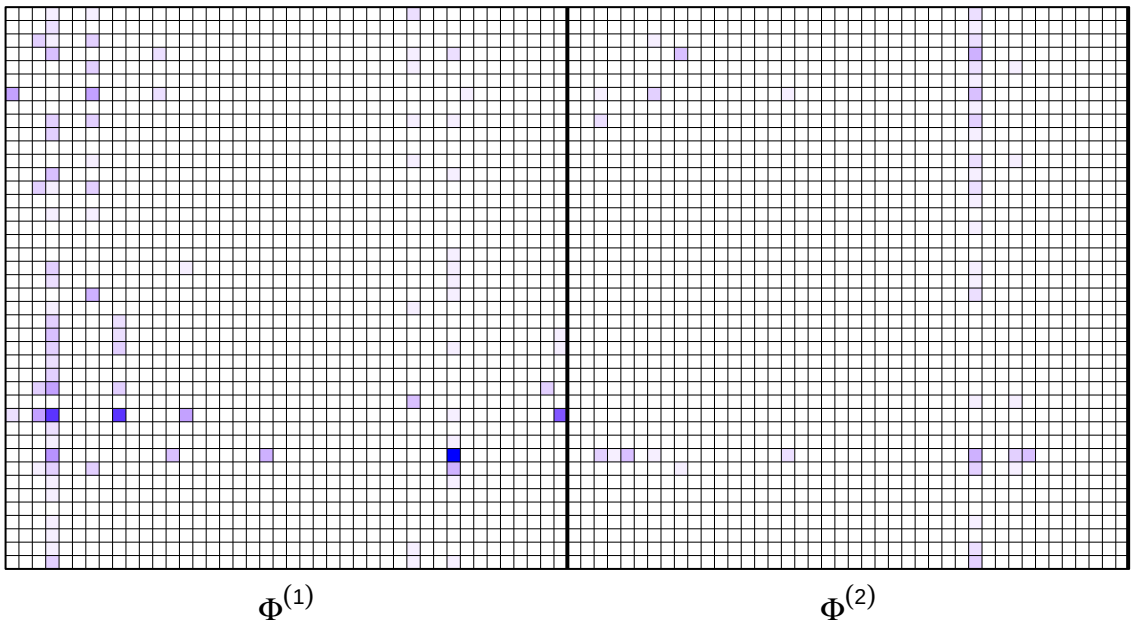



```
plot(var_model)
```




```
SparsityPlot.BigVAR.results(var_model)
```

Sparsity Pattern Generated by BigVAR

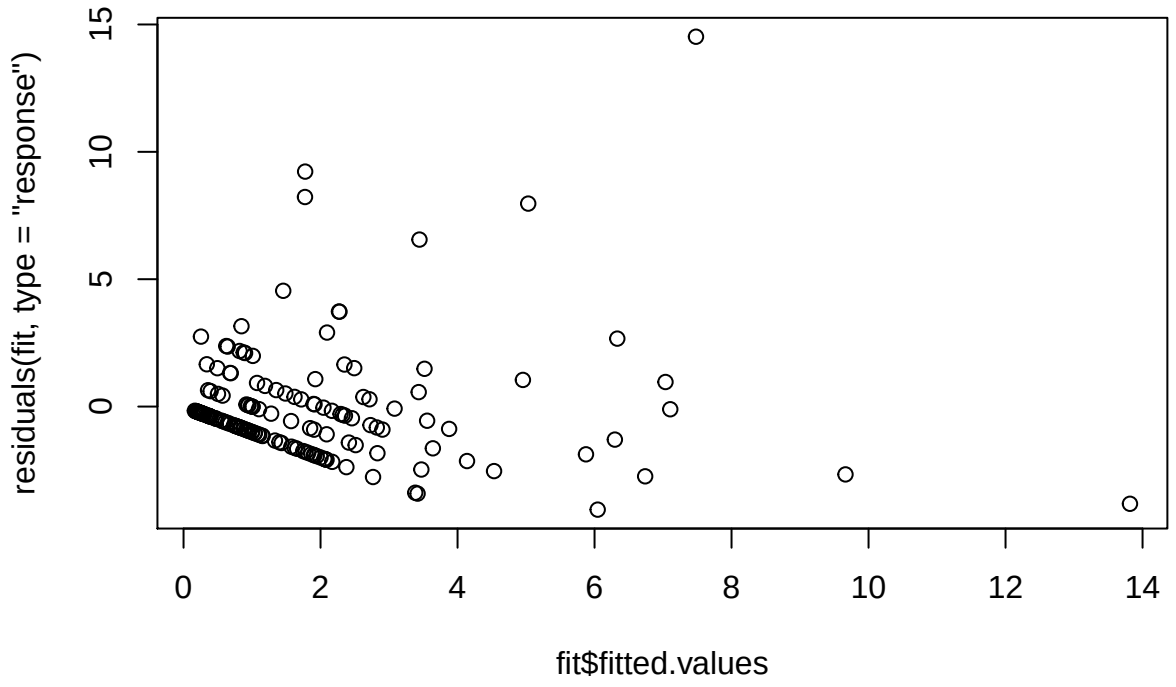



```
train <- df_atleast_50cts[,1:162]
test <- df_atleast_50cts[,163:204]
#for (obs in c(6,12,18)) {
  #for (m in c(6, 12, 18, 24)) {
  for (obs in c(6)) {
    for (m in c(18)) {
      errors <- 0
      for (i in c(1:42)) {
```

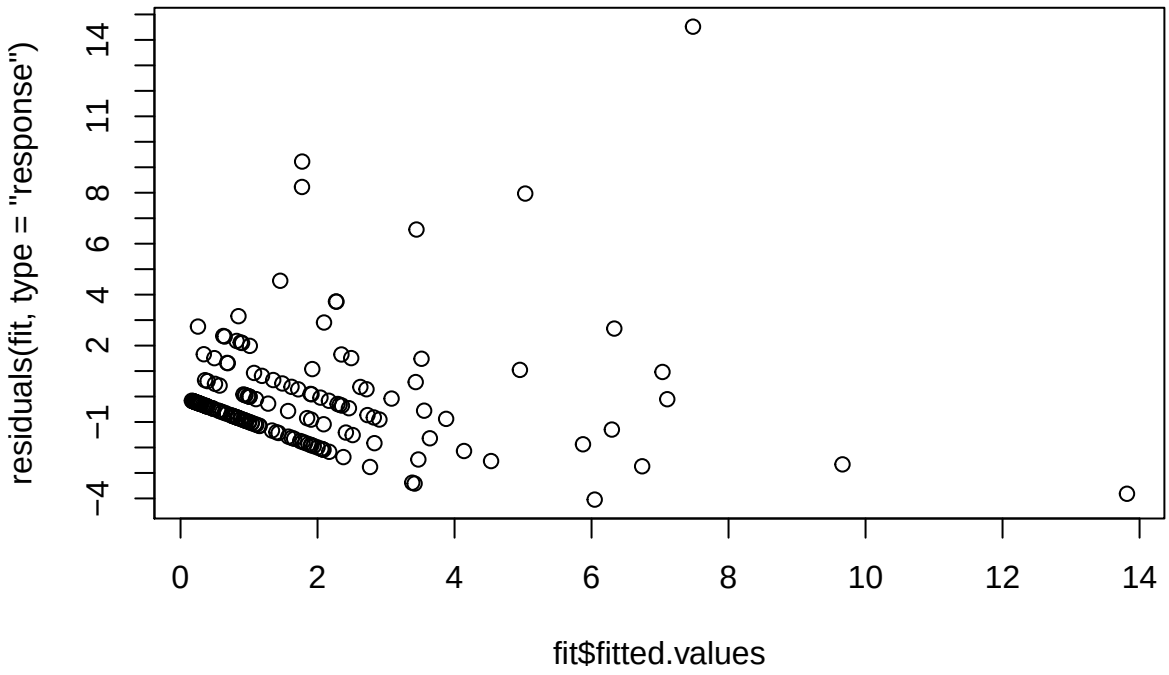
```
        fit <- suppressWarnings(tsglm(as.numeric(train[i,]), model = list(past_obs = c(1:obs), past_m
        pred <- predict(fit, n.ahead=42)
        error <- sum(((as.numeric(test[i,]) - pred$pred)) ^ 2)
        errors <- errors + error
    }
    print(paste0("Max Past ObsL ", obs ," Past Mean: ", m, " MSFE: ", errors/42))
  }
}
```

```
## [1] "Max Past ObsL 6 Past Mean: 18 MSFE: 51.3844730587724"
```

```
plot(x=fit$fitted.values,y=residuals(fit, type='response'))
```




```
plot(x=fit$fitted.values,y=residuals(fit, type='response'), yaxp=c(-5,15,20))
```




```
###WITHOUT EXOGENOUS VARIABLES###
# for MSFE
predictions <- c(predict(var_model, n.ahead = 1))
for (i in c(2:42)) {
  pred <- c(predict(var_model, n.ahead = i))
  predictions <- array(c(predictions, pred), dim = c(42,i))
}
errors <- 0
for (i in c(1:42)) {
  error <- sum((as.numeric(test[i,]) - as.numeric(predictions[i,])) ^ 2)
  errors <- errors + error
}
print(errors/42)
```

```
## [1] 63.15332
```

```
# for RMSE
predictions <- c(predict(var_model, n.ahead = 1))
for (i in c(2:42)) {
  pred <- c(predict(var_model, n.ahead = i))
  predictions <- array(c(predictions, pred), dim = c(42,i))
}
errors <- c()
for (i in c(1:42)) {
  error <- RMSE(as.numeric(test[i,]), as.numeric(predictions[i,]))
  errors <- c(errors,error)
}
print(mean(errors))
```

```
## [1] 1.065666
```