CAPM and other Statistics for HSI Components Version 1.1

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Contents

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1 Introduction

CAPM Analysis on Hang Seng Index Components .
Hang Seng Index itself is used as the benchmark.

In finance, the capital asset pricing model (CAPM) is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given that asset's non-diversifiable risk. The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity beta in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset.

The model was introduced by Jack Treynor (1961, 1962),[1] William Sharpe (1964), John Lintner (1965a,b) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory. Sharpe, Markowitz and Merton Miller jointly received the Nobel Memorial Prize in Economics for this contribution to the field of financial economics.[1]

We attempt to show the CAPM data for all HSI components with data from Yahoo starting with 2009-01-01 and generate some more charts and statistics on the way.

This document is generated on a daily basis to have snapshots of the data for further study , if one is so inclined.

[1] Wikipedia

2 CAPM Analysis

The general idea behind CAPM is that investors need to be compensated in two ways: time value of money and risk. The time value of money is represented by the risk-free (rf) rate in the formula and compensates the investors for placing money in any investment over a period of time. The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (beta) that compares the returns of the asset to the market over a period of time and to the market premium (Rm-rf).[2]

2.1 HSI Components CAPM with HSI as benchmark

CAPM - Combined

```
## Warning message: missing values removed from data

##                      HSI Components to HSI
## Alpha                              -0.0004
## Beta                                1.1900
## Beta+                               1.2402
## Beta-                               1.2100
## R-squared                           0.6410
## Annualized Alpha                   -0.0866
## Correlation                         0.8006
## Correlation p-value                 0.0000
## Tracking Error                      0.2692
## Active Premium                     -0.1297
## Information Ratio                  -0.4816
## Treynor Ratio                      -0.2421
```

[2] http://www.investopedia.com/terms/c/capm.asp

CAPM - Distinct for each stock

```
##                     0001.HK 0002.HK 0003.HK 0004.HK 0005.HK 0006.HK
## Alpha                 0.000   0.000   0.000   0.001  -0.001   0.000
## Beta                  0.988   0.147   0.378   1.111   1.121   0.114
## Beta+                 0.954   0.043   0.277   1.112   1.211   0.060
## Beta-                 0.974   0.185   0.410   1.093   1.308   0.128
## R-squared             0.639   0.080   0.179   0.494   0.560   0.028
## Annualized Alpha      0.002   0.049   0.111   0.167  -0.131   0.090
## Correlation           0.800   0.282   0.423   0.703   0.749   0.167
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.193   0.258   0.266   0.294   0.260   0.290
## Active Premium       -0.019  -0.063   0.019   0.145  -0.172  -0.034
## Information Ratio    -0.098  -0.246   0.072   0.493  -0.660  -0.118
## Treynor Ratio         0.109   0.430   0.385   0.244  -0.040   0.808
##                     0011.HK 0012.HK 0013.HK 0016.HK 0017.HK 0019.HK
## Alpha                 0.000   0.000   0.000   0.000   0.000   0.000
## Beta                  0.639   1.019   0.948   1.004   1.137   0.785
## Beta+                 0.703   1.049   0.865   0.968   1.059   0.852
## Beta-                 0.672   0.997   0.987   0.982   1.149   0.719
## R-squared             0.452   0.556   0.527   0.643   0.504   0.384
## Annualized Alpha     -0.077   0.027   0.135   0.062  -0.067   0.074
## Correlation           0.673   0.746   0.726   0.802   0.710   0.620
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.206   0.237   0.234   0.195   0.296   0.265
## Active Premium       -0.139   0.000   0.112   0.047  -0.109   0.020
## Information Ratio    -0.677   0.002   0.480   0.244  -0.368   0.074
## Treynor Ratio        -0.020   0.125   0.252   0.173   0.016   0.186
##                     0023.HK 0066.HK 0083.HK 0101.HK 0144.HK 0151.HK
## Alpha                 0.000   0.000   0.000   0.000   0.000   0.001
## Beta                  0.940   0.509   1.167   1.095   1.310   0.431
## Beta+                 1.020   0.430   1.136   1.247   1.256   0.204
## Beta-                 0.927   0.502   1.205   0.979   1.214   0.517
## R-squared             0.463   0.337   0.516   0.466   0.541   0.097
## Annualized Alpha      0.127   0.071   0.053   0.048   0.101   0.314
## Correlation           0.680   0.581   0.719   0.682   0.736   0.311
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.264   0.226   0.297   0.306   0.325   0.374
## Active Premium        0.094   0.002   0.025   0.010   0.082   0.189
## Information Ratio     0.357   0.008   0.084   0.033   0.253   0.506
## Treynor Ratio         0.235   0.252   0.130   0.125   0.159   0.732
##                     0267.HK 0291.HK 0293.HK 0322.HK 0330.HK 0386.HK
## Alpha                 0.000   0.001   0.000   0.001  -0.002   0.000
## Beta                  1.080   0.879   0.767   0.348   0.939   0.954
## Beta+                 1.031   0.778   0.732   0.264   0.736   0.807
## Beta-                 0.976   0.908   0.745   0.383   1.102   1.003
## R-squared             0.403   0.369   0.319   0.071   0.216   0.558
## Annualized Alpha      0.064   0.175   0.131   0.350  -0.346   0.134
## Correlation           0.635   0.608   0.564   0.267   0.464   0.747
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.343   0.301   0.298   0.369   0.467   0.222
## Active Premium        0.013   0.127   0.069   0.218  -0.471   0.116
## Information Ratio     0.037   0.421   0.230   0.592  -1.010   0.522
## Treynor Ratio         0.129   0.288   0.254   0.992  -0.367   0.254
##                     0388.HK 0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
## Alpha                 0.000   0.001   0.000   0.002   0.000   0.000
## Beta                  1.159   1.238   1.184   0.932   0.705   0.556
```

```
## Beta+                 1.245   1.103   1.345   0.970   0.545   0.428
## Beta-                 1.104   0.896   0.933   0.774   0.656   0.660
## R-squared             0.706   0.451   0.472   0.353   0.255   0.178
## Annualized Alpha      0.081   0.330   0.013   0.450   0.091  -0.035
## Correlation           0.840   0.671   0.687   0.594   0.505   0.422
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.199   0.410   0.330   0.329   0.322   0.332
## Active Premium        0.084   0.129  -0.028   0.413   0.012  -0.135
## Information Ratio     0.423   0.315  -0.084   1.256   0.038  -0.408
## Treynor Ratio         0.182  -0.039   0.083   0.572   0.195  -0.016
##                     0857.HK 0883.HK 0939.HK 0941.HK 1044.HK 1088.HK
## Alpha                 0.000   0.001   0.000   0.000   0.001   0.000
## Beta                  1.100   1.282   1.062   0.710   0.461   1.217
## Beta+                 1.018   1.195   1.004   0.704   0.364   1.141
## Beta-                 1.099   1.246   1.037   0.737   0.412   1.144
## R-squared             0.725   0.685   0.700   0.519   0.118   0.650
## Annualized Alpha      0.042   0.157   0.006  -0.082   0.391   0.126
## Correlation           0.852   0.828   0.837   0.720   0.343   0.806
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.178   0.238   0.182   0.193   0.356   0.240
## Active Premium        0.039   0.171  -0.006  -0.136   0.279   0.130
## Information Ratio     0.220   0.719  -0.033  -0.703   0.782   0.541
## Treynor Ratio         0.151   0.232   0.114  -0.013   0.867   0.210
##                     1109.HK 1199.HK 1299.HK 1398.HK 1880.HK 1898.HK
## Alpha                 0.000   0.000   0.001   0.000   0.002   0.000
## Beta                  1.164   1.331   0.823   1.129   0.827   1.496
## Beta+                 1.226   1.338   0.816   1.100   0.782   1.406
## Beta-                 0.780   1.439   1.060   1.054   0.904   1.441
## R-squared             0.362   0.491   0.411   0.687   0.223   0.664
## Annualized Alpha      0.065   0.034   0.221  -0.027   0.523   0.027
## Correlation           0.602   0.701   0.641   0.829   0.472   0.815
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.404   0.363   0.244   0.201   0.404   0.306
## Active Premium       -0.003  -0.003   0.193  -0.040   0.433   0.024
## Information Ratio    -0.008  -0.008   0.789  -0.200   1.072   0.079
## Treynor Ratio         0.106   0.093   0.130   0.076   0.677   0.101
##                     2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## Alpha                 0.000   0.001  -0.001   0.000   0.000   0.000
## Beta                  1.330   0.877   1.539   1.097   1.195   1.034
## Beta+                 1.377   0.887   1.585   1.069   1.159   0.957
## Beta-                 1.226   0.845   1.393   1.065   1.217   1.011
## R-squared             0.623   0.443   0.619   0.639   0.729   0.632
## Annualized Alpha      0.058   0.216  -0.146  -0.118  -0.086   0.047
## Correlation           0.789   0.665   0.787   0.800   0.854   0.795
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.283   0.258   0.344   0.216   0.196   0.206
## Active Premium        0.051   0.185  -0.176  -0.148  -0.099   0.032
## Information Ratio     0.180   0.716  -0.511  -0.687  -0.504   0.153
## Treynor Ratio         0.134   0.355  -0.032  -0.020   0.023   0.153
```

3 HSI Components Risk

3.1 Correlation

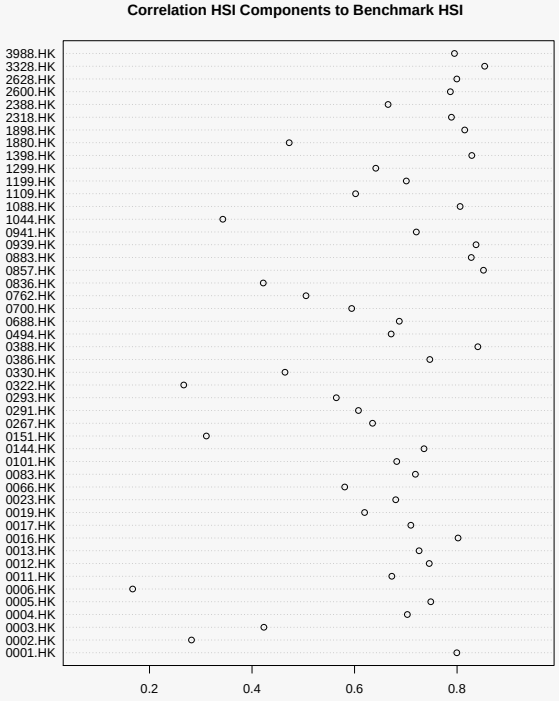
Correlation Combined

```
##                       Correlation p-value Lower CI Upper CI
## HSI Components to HSI      0.8006       0   0.7156   0.8622
```

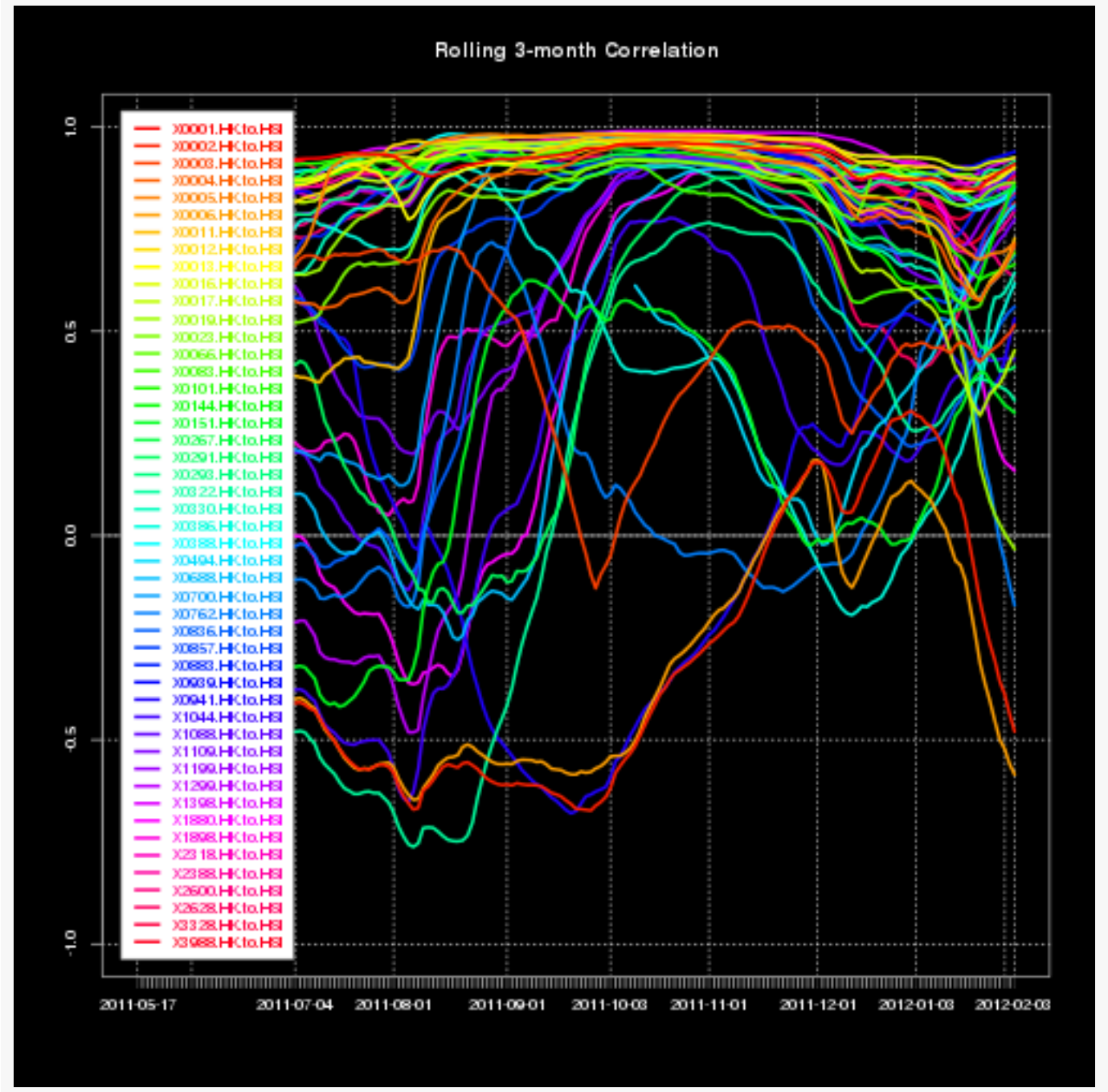
Correlation - Distinct

```
##         Correlation p-value Lower CI Upper CI
## 0001.HK      0.7995       0   0.7633   0.8308
## 0002.HK      0.2819       0   0.1940   0.3653
## 0003.HK      0.4231       0   0.3436   0.4965
## 0004.HK      0.7030       0   0.6526   0.7471
## 0005.HK      0.7487       0   0.7047   0.7869
## 0006.HK      0.1671       0   0.0753   0.2561
## 0011.HK      0.6727       0   0.6184   0.7206
## 0012.HK      0.7457       0   0.7014   0.7843
## 0013.HK      0.7259       0   0.6787   0.7671
## 0016.HK      0.8019       0   0.7660   0.8328
## 0017.HK      0.7098       0   0.6605   0.7531
## 0019.HK      0.6196       0   0.5589   0.6738
## 0023.HK      0.6803       0   0.6269   0.7272
## 0066.HK      0.5808       0   0.5156   0.6392
## 0083.HK      0.7187       0   0.6705   0.7608
## 0101.HK      0.6823       0   0.6293   0.7290
## 0144.HK      0.7355       0   0.6896   0.7754
## 0151.HK      0.3109       0   0.2244   0.3925
## 0267.HK      0.6351       0   0.5761   0.6875
## 0291.HK      0.6076       0   0.5454   0.6631
## 0293.HK      0.5644       0   0.4976   0.6246
## 0322.HK      0.2668       0   0.1782   0.3510
## 0330.HK      0.4643       0   0.3880   0.5342
## 0386.HK      0.7468       0   0.7026   0.7852
## 0388.HK      0.8405       0   0.8109   0.8658
## 0494.HK      0.6714       0   0.5456   0.7676
## 0688.HK      0.6873       0   0.6349   0.7334
## 0700.HK      0.5944       0   0.5308   0.6513
## 0762.HK      0.5053       0   0.4327   0.5714
## 0836.HK      0.4219       0   0.3424   0.4955
## 0857.HK      0.8515       0   0.8237   0.8752
## 0883.HK      0.8277       0   0.7960   0.8549
## 0939.HK      0.8370       0   0.8068   0.8628
## 0941.HK      0.7205       0   0.6726   0.7624
## 1044.HK      0.3430       0   0.2585   0.4223
## 1088.HK      0.8059       0   0.7707   0.8363
## 1109.HK      0.6020       0   0.5392   0.6581
## 1199.HK      0.7010       0   0.6504   0.7454
## 1299.HK      0.6414       0   0.5472   0.7196
## 1398.HK      0.8287       0   0.7972   0.8558
## 1880.HK      0.4725       0   0.3970   0.5417
## 1898.HK      0.8149       0   0.7811   0.8440
## 2318.HK      0.7890       0   0.7512   0.8217
## 2388.HK      0.6654       0   0.6102   0.7142
## 2600.HK      0.7869       0   0.7487   0.8199
## 2628.HK      0.7995       0   0.7632   0.8307
```

```
## 3328.HK      0.8538        0   0.8264   0.8771
## 3988.HK      0.7949        0   0.7579   0.8268
```



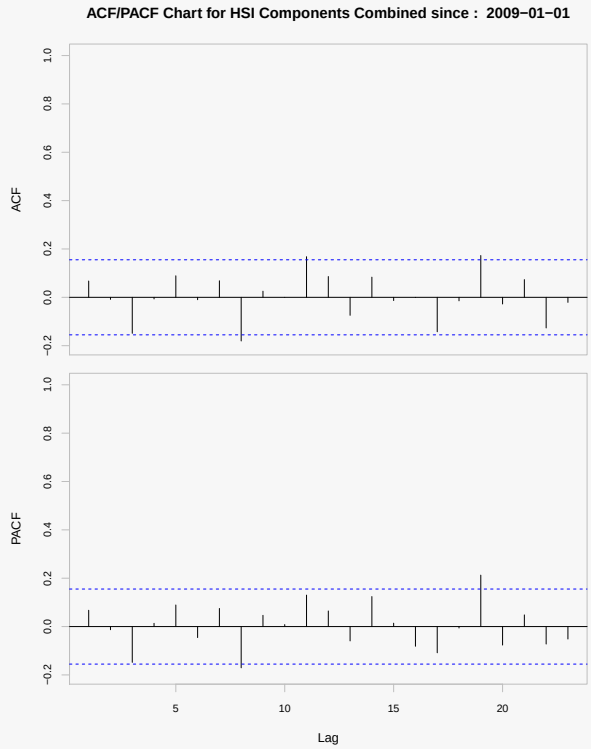
3 Month Rolling Correlation



3.2 Autocorrelation Coefficients - Combined

Autocorrelation Combined

```
##                  rho1    rho2    rho3    rho4   rho5    rho6 Q(6) p-value
## daily.returns 0.0675 -0.0085 -0.1489 -0.0067 0.0891 -0.0099        0.426
```



3.3 Downside Risk - Combined

Downside Risk Combined

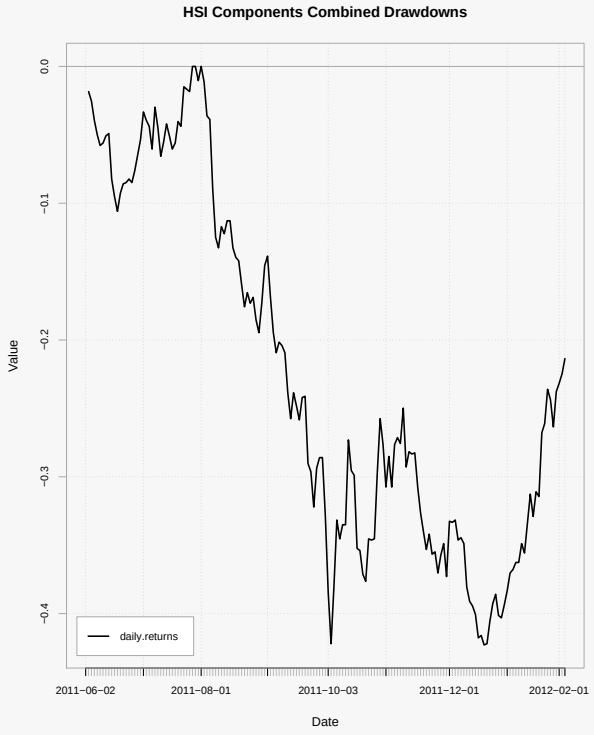
```
##                                HSI Components dailyReturn
## Semi Deviation                                      0.0260
## Gain Deviation                                      0.0203
## Loss Deviation                                      0.0176
## Downside Deviation (MAR=210%)                       0.0296
## Downside Deviation (Rf=0%)                          0.0267
## Downside Deviation (0%)                             0.0267
## Maximum Drawdown                                    0.4229
## Historical VaR (95%)                               -0.0418
## Historical ES (95%)                                -0.0608
## Modified VaR (95%)                                 -0.0432
## Modified ES (95%)                                  -0.0555
```

3.4 Drawdowns - Combined

Drawdowns Combined

```
## Warning message: Only 3 available in the data.
```

```
##         From     Trough         To   Depth Length To Trough Recovery
## 1 2011-08-02 2011-12-19       <NA> -0.4229    127        98       NA
## 2 2011-06-03 2011-06-20 2011-07-28 -0.1060     38        11       27
## 3 2011-07-29 2011-07-29 2011-08-01 -0.0104      2         1        1
```



3.5 Downside Deviation - Combined

Downside Deviation Combined

```
##                                 HSI Components
## Downside Deviation (MAR = 0%)          0.02671
```

3.6 Autocorrelation Coefficients - Distinct

```
##             rho1    rho2    rho3    rho4    rho5    rho6 Q(6) p-value
## X0001.HK  0.0511 -0.0626  0.0183 -0.0335  0.0083  0.0118       0.3896
## X0002.HK -0.1255 -0.0465 -0.0092  0.0181  0.0181 -0.0321       0.0191
## X0003.HK -0.0992 -0.0157 -0.0207  0.0486  0.0143  0.0278       0.0993
## X0004.HK  0.0082 -0.0333 -0.0302 -0.0300  0.0915 -0.0391       0.1260
## X0005.HK -0.0241 -0.0248  0.0602  0.0332 -0.0476  0.0301       0.3184
## X0006.HK -0.0839 -0.0615  0.0139 -0.0231  0.0035 -0.0736       0.0416
## X0011.HK  0.1186  0.0150 -0.0165  0.0036 -0.0474 -0.0825       0.0057
## X0012.HK  0.0671 -0.0249 -0.0498 -0.0074  0.0462  0.0071       0.2704
## X0013.HK  0.0018  0.0314  0.0120 -0.0134  0.0253 -0.0262       0.9163
## X0016.HK  0.0468 -0.0555  0.0228 -0.0104  0.0396  0.0181       0.4223
## X0017.HK  0.0774  0.0204  0.0087  0.0251  0.0492 -0.0219       0.2597
## X0019.HK  0.0408  0.0471 -0.0260 -0.1044 -0.0063  0.0176       0.0577
## X0023.HK  0.0895 -0.0065 -0.0092 -0.0056 -0.0482 -0.0394       0.1588
## X0066.HK -0.0747 -0.0002  0.0554 -0.0222 -0.0106 -0.0169       0.2894
## X0083.HK  0.1007 -0.0579 -0.0383  0.0013  0.0462  0.0028       0.0404
## X0101.HK -0.0727 -0.0202  0.0144 -0.0418 -0.0580  0.0210       0.1827
## X0144.HK  0.0669 -0.0127 -0.0002 -0.0486 -0.1054 -0.0001       0.0300
## X0151.HK -0.0182 -0.0248 -0.0882 -0.0999  0.0079 -0.0006       0.0246
## X0267.HK  0.1231  0.0381 -0.0542 -0.0225  0.0418  0.0429       0.0058
## X0291.HK -0.0351 -0.0205  0.0065 -0.0435  0.0105 -0.0031       0.8268
## X0293.HK  0.0255 -0.0464 -0.0678 -0.0539  0.0728  0.0702       0.0145
## X0322.HK -0.0120  0.0366 -0.0903 -0.0004 -0.0171 -0.0225       0.2351
## X0330.HK  0.0427  0.1201 -0.0169  0.0402 -0.0074 -0.0199       0.0262
## X0386.HK -0.0217 -0.0227 -0.0401 -0.0155 -0.0092  0.0334       0.7941
## X0388.HK  0.0997 -0.0102  0.0340 -0.0154  0.0050 -0.0147       0.1743
## X0494.HK  0.0668 -0.0139 -0.0152 -0.0504 -0.1508 -0.0047       0.5135
## X0688.HK  0.0795 -0.0520 -0.0523 -0.0511 -0.0102  0.0087       0.0821
## X0700.HK  0.0224 -0.0971  0.0026 -0.0907  0.0043  0.0393       0.0174
## X0762.HK -0.0498 -0.0678 -0.0310 -0.0656  0.0247 -0.0243       0.1040
## X0836.HK -0.0540 -0.0376  0.0001  0.0050 -0.0120 -0.0187       0.7133
## X0857.HK  0.0436 -0.0142  0.0388 -0.0044 -0.0069  0.0052       0.8275
## X0883.HK  0.0436 -0.0510 -0.0121 -0.0288 -0.0584  0.0015       0.3346
## X0939.HK  0.0019  0.0043  0.0203 -0.0573 -0.0303 -0.0336       0.6158
## X0941.HK -0.0165 -0.0164  0.0039 -0.0925  0.0026 -0.0242       0.2779
## X1044.HK -0.0334 -0.0451 -0.0981 -0.0592 -0.0402  0.0135       0.0279
## X1088.HK  0.0471 -0.0030 -0.0258 -0.0340  0.0296 -0.0348       0.5788
## X1109.HK  0.0285 -0.0180 -0.0547 -0.0923  0.0086 -0.0009       0.1327
## X1199.HK  0.0749  0.0460 -0.0060 -0.0649  0.0081  0.0342       0.1176
## X1299.HK -0.0143 -0.0859  0.0191 -0.0770 -0.1136 -0.0072       0.1996
## X1398.HK  0.0188 -0.0002  0.0618 -0.0236 -0.0195 -0.0381       0.5351
## X1880.HK  0.0079 -0.0804 -0.0857 -0.0292 -0.0371 -0.0327       0.0394
## X1898.HK  0.0962  0.0157  0.0007  0.0047 -0.0483 -0.0190       0.1522
## X2318.HK  0.0681 -0.0432 -0.0688 -0.0405  0.0698  0.0073       0.0329
## X2388.HK  0.0713  0.0271  0.0568 -0.0014 -0.0395 -0.0155       0.2128
## X2600.HK  0.0673 -0.0321 -0.0320  0.0010  0.0036  0.0069       0.5287
## X2628.HK -0.0014 -0.0196  0.0398 -0.0581 -0.0058 -0.0049       0.6532
```

```
## X3328.HK  0.0224  0.0341 -0.0052 -0.0590  0.0079 -0.0138       0.6518
## X3988.HK  0.0394 -0.0216  0.0401 -0.0434 -0.0072 -0.0693       0.2373
```

3.7 Downside Deviation - Distinct

```
##                                0001.HK 0002.HK 0003.HK 0004.HK 0005.HK
## Downside Deviation (MAR = 0%)  0.0193  0.0089  0.0156  0.0243  0.0257
##                                0006.HK 0011.HK 0012.HK 0013.HK 0016.HK
## Downside Deviation (MAR = 0%)  0.0111  0.0151  0.0215  0.0193  0.0198
##                                0017.HK 0019.HK 0023.HK 0066.HK 0083.HK
## Downside Deviation (MAR = 0%)  0.0246   0.021  0.0208  0.0133  0.0257
##                                0101.HK 0144.HK 0151.HK 0267.HK 0291.HK
## Downside Deviation (MAR = 0%)  0.0254   0.027  0.0218  0.0256  0.0229
##                                0293.HK 0322.HK 0330.HK 0386.HK 0388.HK
## Downside Deviation (MAR = 0%)  0.0214  0.0201  0.0355  0.0208    0.02
##                                0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
## Downside Deviation (MAR = 0%)  0.0346  0.0261  0.0248  0.0228  0.0205
##                                0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
## Downside Deviation (MAR = 0%)  0.0211  0.0242  0.0211   0.016  0.0205
##                                1088.HK 1109.HK 1199.HK 1299.HK 1398.HK
## Downside Deviation (MAR = 0%)  0.0246   0.029   0.029  0.0201  0.0217
##                                1880.HK 1898.HK 2318.HK 2388.HK 2600.HK
## Downside Deviation (MAR = 0%)  0.0273  0.0301  0.0269    0.02    0.03
##                                2628.HK 3328.HK 3988.HK
## Downside Deviation (MAR = 0%)   0.022  0.0225  0.0219
```

4 General Statistics

Statistics Distinct

```
##                Observations NAs Minimum Quartile 1  Median Arithmetic Mean
## X0001.HK.Close          766  12   56.00     91.263  98.000           99.897
## X0002.HK.Close          766  12   51.10     52.550  57.100           59.159
## X0003.HK.Close          766  12   10.78     17.200  18.100           17.589
## X0004.HK.Close          766  12   15.20     36.625  41.650           41.733
## X0005.HK.Close          766  12   33.00     65.812  79.000           74.967
## X0006.HK.Close          766  12   41.10     43.462  47.100           48.918
## X0011.HK.Close          766  12   67.00    103.125 110.650          109.527
## X0012.HK.Close          766  12   23.75     42.525  48.550           46.955
## X0013.HK.Close          766  12   36.40     52.462  57.800           63.864
## X0016.HK.Close          766  12   55.80    100.025 111.350          108.110
## X0017.HK.Close          766  12    6.20      9.752  13.550           12.754
## X0019.HK.Close          766  12   42.90     84.562  92.525           92.637
## X0023.HK.Close          766  12   12.34     26.550  28.900           28.171
## X0066.HK.Close          766  12   16.14     25.100  26.850           26.024
## X0083.HK.Close          766  12    5.60     11.825  13.620           13.071
## X0101.HK.Close          766  12   13.66     25.525  29.125           28.612
## X0144.HK.Close          766  12   12.20     23.050  26.300           25.923
## X0151.HK.Close          766  12    2.77      4.650   6.160            5.812
## X0267.HK.Close          766  12    7.18     14.205  17.330           17.097
## X0291.HK.Close          766  12   10.66     23.575  27.900           26.052
## X0293.HK.Close          766  12    6.98     12.545  14.680           15.165
## X0322.HK.Close          766  12    8.27     16.145  19.180           18.135
## X0330.HK.Close          766  12    7.93     33.450  42.525           39.449
## X0386.HK.Close          766  12    3.65      6.190   6.775            6.790
## X0388.HK.Close          766  12   54.60    122.650 135.500          136.475
## X0494.HK.Close          167 611   11.60     13.660  14.440           14.596
## X0688.HK.Close          766  12    9.41     14.205  15.450           15.203
## X0700.HK.Close          775   3   41.80    127.100 155.000          147.362
## X0762.HK.Close          773   5    8.31      9.630  10.980           11.868
## X0836.HK.Close          766  12   11.10     14.200  15.360           15.441
## X0857.HK.Close          766  12    5.10      8.680   9.350            9.281
## X0883.HK.Close          766  12    6.08     11.100  13.180           13.520
## X0939.HK.Close          766  12    3.66      5.603   6.250            6.113
## X0941.HK.Close          766  12   63.00     73.250  75.775           75.600
## X1044.HK.Close          778   0   24.25     47.025  58.475           55.992
## X1088.HK.Close          766  12   13.90     29.913  33.150           31.596
## X1109.HK.Close          766  12    7.50     12.880  14.570           14.400
## X1199.HK.Close          766  12    5.40      9.363  10.890           11.108
## X1299.HK.Close          313 465   19.86     22.700  23.950           24.343
## X1398.HK.Close          766  12    3.03      4.952   5.730            5.462
## X1880.HK.Close          766  12    2.98      7.963  11.780           11.005
## X1898.HK.Close          766  12    4.43      9.455  10.600           10.447
## X2318.HK.Close          766  12   30.35     57.900  64.350           65.402
## X2388.HK.Close          766  12    6.30     16.665  18.400           18.684
## X2600.HK.Close          766  12    3.20      5.770   7.045            6.699
## X2628.HK.Close          766  12   17.24     25.863  30.500           29.727
## X3328.HK.Close          766  12    4.17      6.245   8.010            7.608
## X3988.HK.Close          766  12    1.84      3.042   3.940            3.667
##                Geometric Mean Quartile 3 Maximum SE Mean LCL Mean (0.95)
## X0001.HK.Close         98.523    113.975  135.70  0.5890          98.740
## X0002.HK.Close         58.803     64.050   75.00  0.2392          58.689
## X0003.HK.Close         17.452     18.995   21.00  0.0759          17.440
## X0004.HK.Close         39.995     51.250   62.00  0.4026          40.943
```

```
## X0005.HK.Close          73.921     83.100   98.00  0.4288          74.125
## X0006.HK.Close          48.563     53.513   64.80  0.2202          48.486
## X0011.HK.Close         108.753    118.950  134.00  0.4591         108.626
## X0012.HK.Close          46.130     53.150   60.50  0.2986          46.369
## X0013.HK.Close          61.918     77.950   95.90  0.5799          62.726
## X0016.HK.Close         106.367    118.775  146.30  0.6569         106.821
## X0017.HK.Close          12.295     15.320   18.54  0.1198          12.519
## X0019.HK.Close          90.172    109.350  136.40  0.7260          91.212
## X0023.HK.Close          27.628     32.188   35.90  0.1842          27.809
## X0066.HK.Close          25.797     28.250   31.15  0.1185          25.792
## X0083.HK.Close          12.803     14.800   18.56  0.0907          12.893
## X0101.HK.Close          28.009     32.388   40.30  0.2034          28.213
## X0144.HK.Close          25.378     28.900   37.55  0.1840          25.562
## X0151.HK.Close           5.659      6.950    8.19  0.0495           5.715
## X0267.HK.Close          16.599     20.600   24.40  0.1443          16.814
## X0291.HK.Close          25.028     30.800   35.25  0.2383          25.584
## X0293.HK.Close          14.631     18.340   24.05  0.1474          14.875
## X0322.HK.Close          17.488     20.837   25.95  0.1630          17.815
## X0330.HK.Close          35.617     50.650   64.30  0.5269          38.415
## X0386.HK.Close           6.711      7.598    9.64  0.0386           6.715
## X0388.HK.Close         132.546    160.975  197.50  1.0930         134.330
## X0494.HK.Close          14.534     15.510   18.42  0.1082          14.382
## X0688.HK.Close          15.074     16.655   19.44  0.0711          15.063
## X0700.HK.Close         137.154    179.750  225.00  1.6993         144.026
## X0762.HK.Close          11.639     14.200   17.40  0.0907          11.691
## X0836.HK.Close          15.355     16.640   20.15  0.0606          15.322
## X0857.HK.Close           9.177     10.120   12.36  0.0502           9.182
## X0883.HK.Close          13.082     16.420   20.95  0.1247          13.275
## X0939.HK.Close           6.045      6.817    8.28  0.0340           6.047
## X0941.HK.Close          75.495     78.000   91.45  0.1447          75.316
## X1044.HK.Close          53.806     67.888   78.25  0.5137          54.983
## X1088.HK.Close          30.937     35.250   40.80  0.2112          31.181
## X1109.HK.Close          14.159     16.390   20.00  0.0944          14.215
## X1199.HK.Close          10.869     12.700   16.76  0.0856          10.940
## X1299.HK.Close          24.268     26.150   29.55  0.1111          24.125
## X1398.HK.Close           5.398      5.990    7.03  0.0312           5.401
## X1880.HK.Close          10.243     14.260   17.54  0.1396          10.731
## X1898.HK.Close          10.209     11.760   15.86  0.0793          10.292
## X2318.HK.Close          63.909     76.300   94.30  0.4889          64.443
## X2388.HK.Close          17.892     22.950   28.95  0.1857          18.320
## X2600.HK.Close           6.483      7.880   10.66  0.0624           6.577
## X2628.HK.Close          29.099     34.500   41.00  0.2153          29.304
## X3328.HK.Close           7.457      8.720   10.56  0.0559           7.498
## X3988.HK.Close           3.606      4.150    5.00  0.0258           3.616
##                 UCL Mean (0.95)  Variance   Stdev Skewness Kurtosis
## X0001.HK.Close          101.053  265.7711 16.3025  -0.0820  -0.1580
## X0002.HK.Close           59.628   43.8380  6.6210   0.3994  -1.2195
## X0003.HK.Close           17.738    4.4076  2.0994  -1.6011   1.9843
## X0004.HK.Close           42.523  124.1843 11.1438  -0.4567  -0.2427
## X0005.HK.Close           75.808  140.8143 11.8665  -0.7933   0.1914
## X0006.HK.Close           49.350   37.1354  6.0939   0.6795  -0.7538
## X0011.HK.Close          110.428  161.4259 12.7053  -0.5407  -0.0022
## X0012.HK.Close           47.541   68.2831  8.2634  -0.8898   0.2394
## X0013.HK.Close           65.003  257.6216 16.0506   0.3776  -1.0068
## X0016.HK.Close          109.400  330.5286 18.1804  -0.8381   0.6042
## X0017.HK.Close           12.989   10.9905  3.3152  -0.5556  -0.8885
## X0019.HK.Close           94.062  403.6985 20.0923  -0.4628  -0.0145
```

```
## X0023.HK.Close          28.533   26.0040  5.0994  -1.1998   0.9895
## X0066.HK.Close          26.257   10.7560  3.2796  -1.3565   1.1633
## X0083.HK.Close          13.248    6.2961  2.5092  -1.0182   0.7010
## X0101.HK.Close          29.011   31.6866  5.6291  -0.5257  -0.0287
## X0144.HK.Close          26.284   25.9379  5.0929  -0.5064   0.2831
## X0151.HK.Close           5.909    1.8760  1.3697  -0.5222  -0.8311
## X0267.HK.Close          17.381   15.9509  3.9939  -0.4512  -0.6037
## X0291.HK.Close          26.519   43.4844  6.5943  -0.9999  -0.1492
## X0293.HK.Close          15.454   16.6460  4.0799   0.1257  -0.7712
## X0322.HK.Close          18.455   20.3614  4.5124  -0.7823  -0.2169
## X0330.HK.Close          40.484  212.6703 14.5832  -0.7310  -0.4126
## X0386.HK.Close           6.866    1.1402  1.0678  -0.5029   0.5053
## X0388.HK.Close         138.621  915.0854 30.2504  -0.5526   0.2684
## X0494.HK.Close          14.809    1.9546  1.3981   0.2694  -0.3121
## X0688.HK.Close          15.342    3.8706  1.9674  -0.7304   0.0583
## X0700.HK.Close         150.698 2237.9328 47.3068  -0.6916  -0.2926
## X0762.HK.Close          12.046    6.3562  2.5211   0.7381  -0.8976
## X0836.HK.Close          15.560    2.8123  1.6770   0.1459  -0.3446
## X0857.HK.Close           9.379    1.9328  1.3903  -0.7468   0.7543
## X0883.HK.Close          13.764   11.9196  3.4525  -0.0497  -0.7270
## X0939.HK.Close           6.180    0.8865  0.9415  -0.7209   0.0198
## X0941.HK.Close          75.884   16.0293  4.0037   0.0239   0.7580
## X1044.HK.Close          57.000  205.3351 14.3295  -0.7338  -0.5983
## X1088.HK.Close          32.011   34.1823  5.8466  -1.3599   1.3542
## X1109.HK.Close          14.586    6.8268  2.6128  -0.4261  -0.2052
## X1199.HK.Close          11.276    5.6143  2.3695   0.0858  -0.5389
## X1299.HK.Close          24.562    3.8624  1.9653   0.3416  -0.9602
## X1398.HK.Close           5.524    0.7479  0.8648  -0.9495   0.3289
## X1880.HK.Close          11.279   14.9286  3.8637  -0.4297  -0.9436
## X1898.HK.Close          10.603    4.8161  2.1946  -0.5195   0.2856
## X2318.HK.Close          66.362  183.1054 13.5316  -0.2080  -0.3543
## X2388.HK.Close          19.049   26.4042  5.1385  -0.3988  -0.2701
## X2600.HK.Close           6.822    2.9801  1.7263  -0.4401  -0.7032
## X2628.HK.Close          30.149   35.4909  5.9574  -0.3998  -0.9294
## X3328.HK.Close           7.718    2.3940  1.5472  -0.4919  -0.8907
## X3988.HK.Close           3.717    0.5087  0.7132  -0.8105  -0.3498
```

4.1 Higher Moments - Distinct

```
##                 0001.HK 0002.HK 0003.HK 0004.HK 0005.HK 0006.HK 0011.HK
## CoSkewness       0.0000  0.0000  0.0000   0.000  0.0000  0.0000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000   0.000  0.0000  0.0000  0.0000
## Beta CoVariance  0.9879  0.1473  0.3781   1.111  1.1206  0.1142  0.6389
## Beta CoSkewness  1.0029 -0.5827 -0.4517   1.852  0.9476 -0.1964  0.9732
## Beta CoKurtosis  0.9984  0.0865  0.3595   1.120  1.2795  0.0890  0.7198
##                 0012.HK 0013.HK 0016.HK 0017.HK 0019.HK 0023.HK 0066.HK
## CoSkewness        0.000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis        0.000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance   1.019  0.9483  1.0035  1.1367  0.7847  0.9403  0.5088
## Beta CoSkewness   2.048  0.0711  1.3760  0.6234  1.4458  1.8869  0.2199
## Beta CoKurtosis   1.075  0.9008  0.9863  1.1281  0.7975  0.9849  0.4531
##                 0083.HK 0101.HK 0144.HK 0151.HK 0267.HK 0291.HK 0293.HK
## CoSkewness        0.000   0.000   0.000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis        0.000   0.000   0.000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance   1.167   1.095   1.310  0.4314  1.0800  0.8788  0.7669
## Beta CoSkewness   1.249   2.878   1.500 -1.5210  1.3028  0.1349  1.0705
## Beta CoKurtosis   1.172   1.166   1.208  0.3368  0.9848  0.7634  0.7539
##                 0322.HK 0330.HK 0386.HK 0388.HK 0494.HK 0688.HK 0700.HK
## CoSkewness       0.0000  0.0000  0.0000   0.000  0.0000   0.000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000   0.000  0.0000   0.000  0.0000
## Beta CoVariance  0.3476  0.9390  0.9541   1.159  1.2383   1.184  0.9324
## Beta CoSkewness -0.1868 -0.6908 -0.1253   1.834 -0.5228   3.844  1.6633
## Beta CoKurtosis  0.3077  0.8987  0.8893   1.145  1.0335   1.262  0.8977
##                 0762.HK 0836.HK 0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
## CoSkewness       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance  0.7046  0.5557  1.1002  1.2817  1.0624  0.7096  0.4608
## Beta CoSkewness -0.5682 -0.8106  0.5273  0.8685  0.5808  0.6810  0.0064
## Beta CoKurtosis  0.5416  0.4929  1.0088  1.2093  1.0421  0.7031  0.3951
##                 1088.HK 1109.HK 1199.HK 1299.HK 1398.HK 1880.HK 1898.HK
## CoSkewness        0.000   0.000  0.0000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis        0.000   0.000  0.0000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance   1.217   1.164  1.3307  0.8231  1.1291  0.8269  1.4962
## Beta CoSkewness   0.971   3.489  0.7268  1.8099  0.9924  0.1589  0.9554
## Beta CoKurtosis   1.093   1.141  1.2569  0.9854  1.0672  0.7697  1.3885
##                 2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## CoSkewness        0.000  0.0000   0.000  0.0000  0.0000  0.0000
## CoKurtosis        0.000  0.0000   0.000  0.0000  0.0000  0.0000
## Beta CoVariance   1.330  0.8766   1.539  1.0965  1.1953  1.0337
## Beta CoSkewness   2.103  0.8422   2.245  0.8796  0.9671  0.2572
## Beta CoKurtosis   1.319  0.8492   1.449  1.0403  1.1850  0.9703
```

4.2 Higher Moments - Combined

```
##                 HSI Components to HSI Combined
## CoSkewness                              0.0000
## CoKurtosis                              0.0000
## Beta CoVariance                         1.1900
## Beta CoSkewness                         0.4376
## Beta CoKurtosis                         1.1249
```

5 Principal Components Analysis

Principal components analysis, or PCA, seeks to find a set of orthogonal axes such that the first axis, or first principal component, accounts for as much variability as possible and subsequent axes are chosen to maximize variance while maintaining orthogonality with previous axes. Principal components are typically computed either by a singular value decomposition of the data matrix or an eigenvalue decomposition of a covariance or correlation matrix.[3] The calculation and chart below based on correlation. Future improvement here is to use sparse pca to reduce the number of important components to a more manageable number.[4] Principal component analysis (PCA) is an orthogonal transformation of possibly correlated variables into uncorrelated variables called principal components.

Terminology Factor loadings: The factor loadings, also called component loadings in PCA, are the correlation coefficients between the variables (rows) and factors (columns). Analogous to Pearson's r, the squared factor loading is the percent of variance in that indicator variable explained by the factor. To get the percent of variance in all the variables accounted for by each factor, add the sum of the squared factor loadings for that factor (column) and divide by the number of variables. (Note the number of variables equals the sum of their variances as the variance of a standardized variable is 1.) This is the same as dividing the factor's eigenvalue by the number of variables.

Interpreting factor loadings: By one rule of thumb in confirmatory factor analysis, loadings should be .7 or higher to confirm that independent variables identified a priori are represented by a particular factor, on the rationale that the .7 level corresponds to about half of the variance in the indicator being explained by the factor. However, the .7 standard is a high one and real-life data may well not meet this criterion, which is why some researchers, particularly for exploratory purposes, will use a lower level such as .4 for the central factor and .25 for other factors call loadings above .6 "high" and those below .4 "low". In any event, factor loadings must be interpreted in the light of theory, not by arbitrary cutoff levels.

In oblique rotation, one gets both a pattern matrix and a structure matrix. The structure matrix is simply the factor loading matrix as in orthogonal rotation, representing the variance in a measured variable explained by a factor on both a unique and common contributions basis. The pattern matrix, in contrast, contains coefficients which just represent unique contributions. The more factors, the lower the pattern coefficients as a rule since there will be more common contributions to variance explained. For oblique rotation, the researcher looks at both the structure and pattern coefficients when attributing a label to a factor.

Communality: The sum of the squared factor loadings for all factors for a given variable (row) is the variance in that variable accounted for by all the factors, and this is called the communality. The communality measures the percent of variance in a given variable explained by all the factors jointly and may be interpreted as the reliability of the indicator.

Spurious solutions: If the communality exceeds 1.0, there is a spurious solution, which may reflect too small a sample or the researcher has too many or too few factors.

Uniqueness of a variable: That is, uniqueness is the variability of a variable minus its communality.

Eigenvalues:/Characteristic roots: The eigenvalue for a given factor measures the variance in all the variables which is accounted for by that factor. The ratio of eigenvalues is the ratio of explanatory importance of the factors with respect to the variables. If a factor has a low eigenvalue, then it is contributing little to the explanation of variances in the variables and may be ignored as redundant with more important factors. Eigenvalues measure the amount of variation in the total sample accounted for by each factor.

Extraction sums of squared loadings: Initial eigenvalues and eigenvalues after extraction are the same for PCA extraction, but for other extraction methods, eigenvalues after extraction will be lower than their initial counterparts.

Factor scores (also called component scores in PCA): are the scores of each case (row) on each factor (column). To compute the factor score for a given case for a given factor, one takes the case's standardized score on each variable, multiplies by the corresponding factor loading of the variable for the given factor, and sums these products. Computing factor scores allows one to look for factor outliers. Also, factor scores may be used as variables in subsequent modeling.

Criteria for determining the number of factors Using one or more of the methods below, the researcher determines an appropriate range of solutions to investigate. Methods may not agree. For instance, the Kaiser criterion may suggest five factors and the scree test may suggest two, so the researcher may request 3-, 4-, and 5-factor solutions discuss each in terms of their relation to external data and theory.

Comprehensibility: A purely subjective criterion would be to retain those factors whose meaning is comprehensible to the researcher. This is not recommended.[5]

[3] http://blog.revolutionanalytics.com/2011/06/big-data-pca.html

[4] http://statmath.wu.ac.at/courses/optimization/Presentations/Nops+Thomas-sPCA1.pdf

[5] http://en.wikipedia.org/wiki/Factoranalysis

5.1 PCA with stats package princomp function

```
## Importance of components:
##                         Comp.1  Comp.2  Comp.3  Comp.4  Comp.5  Comp.6
## Standard deviation     5.1443 1.53139 1.20020 1.12752 1.06690 1.03498
## Proportion of Variance 0.5513 0.04886 0.03001 0.02649 0.02371 0.02232
## Cumulative Proportion  0.5513 0.60019 0.63020 0.65669 0.68040 0.70272
##                         Comp.7  Comp.8  Comp.9 Comp.10 Comp.11 Comp.12
## Standard deviation     0.96047 0.95088 0.89015 0.86997 0.83230 0.81130
## Proportion of Variance 0.01922 0.01884 0.01651 0.01577 0.01443 0.01371
## Cumulative Proportion  0.72194 0.74078 0.75728 0.77305 0.78748 0.80120
##                        Comp.13 Comp.14 Comp.15 Comp.16 Comp.17  Comp.18
## Standard deviation     0.78244 0.77823 0.74710 0.73363 0.69382 0.675741
## Proportion of Variance 0.01275 0.01262 0.01163 0.01121 0.01003 0.009513
## Cumulative Proportion  0.81395 0.82657 0.83820 0.84941 0.85944 0.868950
##                         Comp.19  Comp.20  Comp.21  Comp.22  Comp.23
## Standard deviation     0.660796 0.653353 0.612993 0.593134 0.588136
## Proportion of Variance 0.009097 0.008893 0.007828 0.007329 0.007206
## Cumulative Proportion  0.878047 0.886940 0.894769 0.902098 0.909304
##                         Comp.24  Comp.25  Comp.26  Comp.27  Comp.28
## Standard deviation     0.575445 0.560640 0.553583 0.534836 0.518672
## Proportion of Variance 0.006899 0.006548 0.006384 0.005959 0.005605
## Cumulative Proportion  0.916203 0.922751 0.929136 0.935095 0.940700
##                         Comp.29  Comp.30  Comp.31  Comp.32  Comp.33
## Standard deviation     0.499308 0.485139 0.464471 0.455035 0.440988
## Proportion of Variance 0.005194 0.004903 0.004494 0.004314 0.004051
## Cumulative Proportion  0.945894 0.950797 0.955291 0.959605 0.963657
##                         Comp.34  Comp.35  Comp.36  Comp.37  Comp.38
## Standard deviation     0.437369 0.417328 0.399320 0.398206 0.373277
## Proportion of Variance 0.003985 0.003628 0.003322 0.003303 0.002903
## Cumulative Proportion  0.967642 0.971270 0.974592 0.977896 0.980799
##                         Comp.39  Comp.40  Comp.41  Comp.42  Comp.43
## Standard deviation     0.367178 0.353780 0.345961 0.329554 0.312688
## Proportion of Variance 0.002809 0.002608 0.002494 0.002263 0.002037
## Cumulative Proportion  0.983607 0.986215 0.988708 0.990971 0.993008
##                         Comp.44 Comp.45  Comp.46  Comp.47  Comp.48
## Standard deviation     0.281276  0.2771 0.265926 0.244073 0.222288
## Proportion of Variance 0.001648  0.0016 0.001473 0.001241 0.001029
## Cumulative Proportion  0.994656  0.9963 0.997730 0.998971 1.000000

##
## Loadings:
##          Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
## X0001.HK -0.175                -0.173                 0.109
## X0002.HK         0.469                 0.128  0.195 -0.346
## X0003.HK         0.351  0.166 -0.265 -0.173         0.106  0.197  0.152
## X0004.HK -0.161 -0.106        -0.124                        0.152 -0.134
## X0005.HK -0.171                                -0.104  0.108
## X0006.HK         0.472 -0.127         0.173  0.120 -0.340  0.109
## X0011.HK -0.159                -0.276         0.134                -0.155
## X0012.HK -0.160                -0.190                 0.103
## X0013.HK -0.168                -0.126         0.159
## X0016.HK -0.171                -0.160                 0.141  0.140
## X0017.HK -0.139        -0.131 -0.159 -0.107                 0.169  0.414
## X0019.HK -0.114         0.159 -0.185        -0.134 -0.105 -0.549  0.317
## X0023.HK -0.149                -0.153  0.195  0.107        -0.239 -0.264
## X0066.HK -0.133  0.140  0.158 -0.211        -0.124        -0.123 -0.165
```

```
## X0083.HK -0.154        -0.126 -0.140                0.103  0.151
## X0101.HK -0.153        -0.165 -0.124         0.153         0.134
## X0144.HK -0.155                0.199
## X0151.HK -0.101 -0.122  0.486  0.149        -0.198         0.213  0.237
## X0267.HK -0.159                                     -0.104 -0.107
## X0291.HK -0.121                                     -0.157         0.276
## X0293.HK -0.135 -0.135                       0.175 -0.254 -0.230  0.230
## X0322.HK        -0.114  0.544 -0.110  0.143  0.115         0.172 -0.110
## X0330.HK                             -0.465 -0.269 -0.529  0.110 -0.132
## X0386.HK -0.130  0.245         0.282 -0.187         0.242 -0.187
## X0388.HK -0.166               -0.148        -0.125
## X0494.HK -0.132                             -0.252         0.292 -0.208
## X0688.HK -0.155 -0.154 -0.139         0.102  0.102 -0.101        -0.122
## X0700.HK -0.144                0.244  0.223  0.140
## X0762.HK -0.130  0.151  0.149  0.264                0.104        -0.104
## X0836.HK                0.118        -0.612  0.390        -0.126 -0.208
## X0857.HK -0.155  0.156         0.158 -0.140         0.217
## X0883.HK -0.168                0.163
## X0939.HK -0.170
## X0941.HK -0.114  0.334  0.130                -0.110
## X1044.HK -0.114         0.341  0.205  0.133
## X1088.HK -0.167                0.104
## X1109.HK -0.153 -0.212                              -0.115        -0.211
## X1199.HK -0.161        -0.125  0.165                       0.152
## X1299.HK -0.139                                0.381  0.148
## X1398.HK -0.176                       0.115
## X1880.HK -0.130                0.215  0.110  0.273 -0.167         0.309
## X1898.HK -0.163                             -0.132 -0.128        -0.126
## X2318.HK -0.166                             -0.135        -0.164
## X2388.HK -0.165                       0.159                -0.120
## X2600.HK -0.155        -0.127               -0.124
## X2628.HK -0.153                             -0.208  0.127
## X3328.HK -0.174                             -0.111
## X3988.HK -0.168                             -0.125        -0.105 -0.130
##          Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15 Comp.16 Comp.17
## X0001.HK                                                             0.120
## X0002.HK                        -0.124  -0.208          0.140  -0.175
## X0003.HK          0.187                  0.423   0.185  -0.239
## X0004.HK                  0.144                                0.134
## X0005.HK
## X0006.HK  0.140  -0.375          0.193   0.150  -0.152  -0.206   0.122
## X0011.HK -0.140
## X0012.HK  0.113          0.209          -0.173
## X0013.HK -0.159
## X0016.HK                                                     0.140
## X0017.HK         -0.253  -0.254  -0.136  -0.125
## X0019.HK         -0.225   0.129   0.149   0.184          0.145
## X0023.HK          0.174                                          0.253
## X0066.HK -0.167   0.146   0.134  -0.303  -0.141  -0.277  -0.213
## X0083.HK  0.170          0.213  -0.162  -0.209                 0.124
## X0101.HK                        0.205                  0.251
## X0144.HK -0.128                                              0.318
## X0151.HK  0.201  -0.161          -0.128          0.123         0.184
## X0267.HK         -0.123   0.132          -0.112  -0.117   0.171  -0.103
## X0291.HK  0.269   0.516   0.146   0.475  -0.221         -0.156
## X0293.HK          0.121                  -0.151  -0.266         0.128
## X0322.HK  0.282          -0.357   0.165          -0.278   0.249  -0.169
```

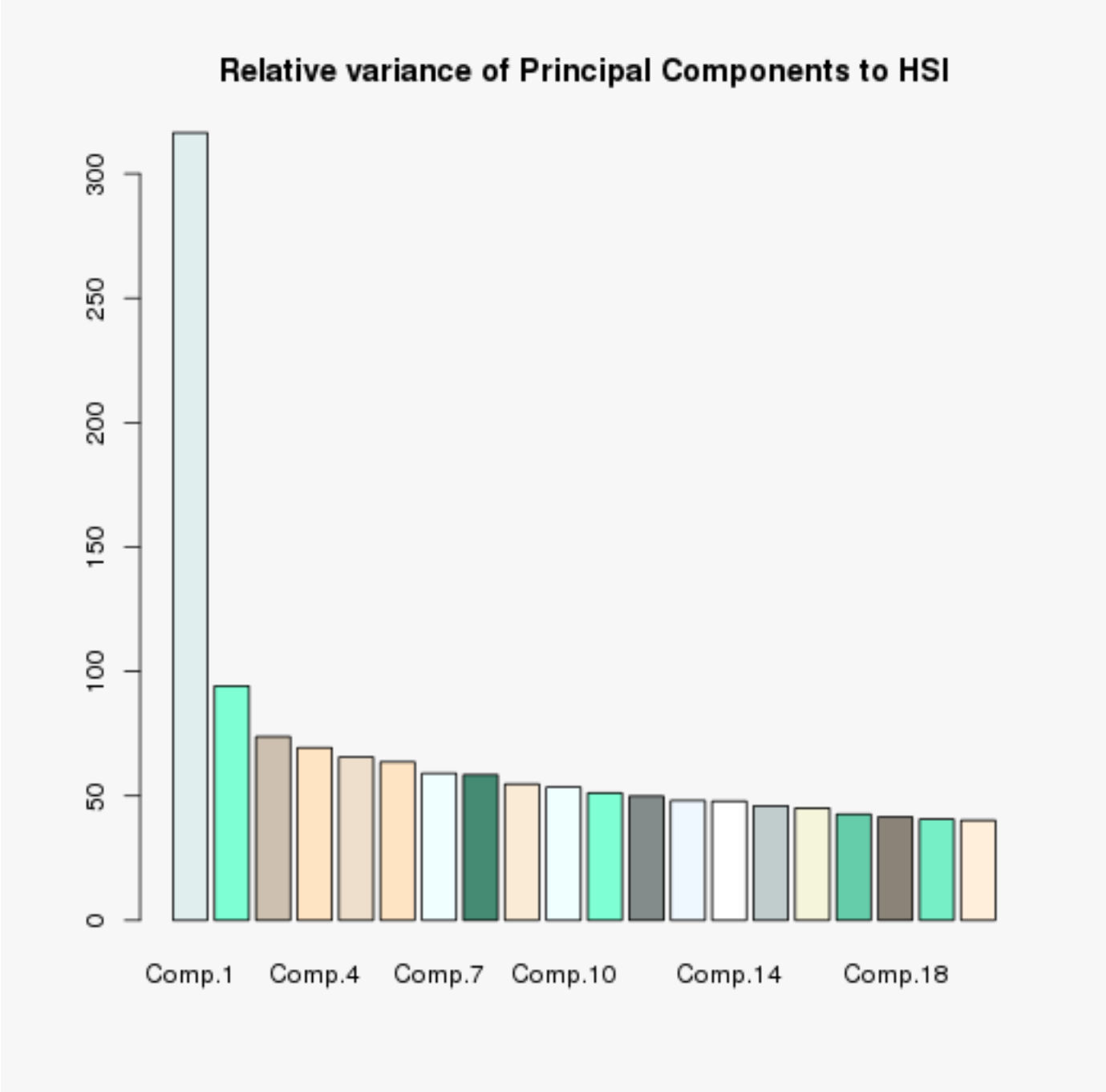
```
## X0330.HK -0.107   0.137  -0.124  -0.162           0.165   0.134  -0.108
## X0386.HK                                         -0.142          -0.213
## X0388.HK                                                 -0.156  -0.223
## X0494.HK -0.334                   0.405                   0.156   0.295
## X0688.HK  0.186   0.162          -0.194   0.268
## X0700.HK                  0.120  -0.219          -0.163
## X0762.HK  0.131           0.141          -0.269   0.503   0.251  -0.108
## X0836.HK  0.219  -0.260           0.101                   -0.220
## X0857.HK          0.130           0.109          -0.196   0.176  -0.119
## X0883.HK                                  -0.177
## X0939.HK  0.107          -0.280           -0.136          -0.152   0.107
## X0941.HK  0.100   0.291          -0.206          -0.168   0.183   0.400
## X1044.HK -0.329           0.296           -0.199          -0.363  -0.107
## X1088.HK                  0.128           0.133   0.212   0.122
## X1109.HK  0.201           0.174           0.258
## X1199.HK                                 -0.112  -0.115                   0.110
## X1299.HK -0.235   0.141  -0.194                   0.176
## X1398.HK                  -0.243                           -0.158
## X1880.HK -0.203   0.118                   0.258                   -0.121
## X1898.HK -0.111          -0.144   0.191
## X2318.HK  0.103  -0.122
## X2388.HK -0.145          -0.190          -0.107   0.175
## X2600.HK  0.190                           0.154                   -0.152
## X2628.HK                                  0.144  -0.304           -0.358
## X3328.HK                  -0.143                           -0.212
## X3988.HK  0.112          -0.309                           -0.194   0.107
##          Comp.18 Comp.19 Comp.20 Comp.21 Comp.22 Comp.23 Comp.24 Comp.25
## X0001.HK           0.149
## X0002.HK                                          0.110   0.200
## X0003.HK -0.232   0.310                   0.228  -0.136
## X0004.HK          -0.108          -0.145  -0.188  -0.166           -0.232
## X0005.HK -0.173           0.114   0.133  -0.225   0.173
## X0006.HK                          0.168                   -0.114
## X0011.HK                                                           0.218
## X0012.HK  0.209          -0.319  -0.119           0.149
## X0013.HK                  0.146
## X0016.HK                          0.200   0.104   0.140           -0.134
## X0017.HK          -0.100                  0.187  -0.147           0.320
## X0019.HK          -0.139           0.280                   0.123
## X0023.HK -0.192           0.108   0.141                   -0.162
## X0066.HK          -0.420                                           -0.187
## X0083.HK  0.103   0.171           0.183
## X0101.HK  0.273                   -0.255           0.148           0.138
## X0144.HK -0.364  -0.122  -0.184          -0.160           -0.109   0.303
## X0151.HK                  0.147           -0.196           0.213  -0.205
## X0267.HK -0.190          -0.103           0.320           -0.279
## X0291.HK          -0.285   0.182                                   0.134
## X0293.HK -0.105   0.437          -0.216  -0.262  -0.316           -0.141
## X0322.HK                  -0.136
## X0330.HK  0.236   0.218           0.135
## X0386.HK                  -0.202                   -0.116   0.197
## X0388.HK                  0.118   -0.298  -0.155  -0.163           -0.112
## X0494.HK                  0.160           0.145   -0.221
## X0688.HK                  -0.111   0.112   0.164
## X0700.HK                  0.331   -0.112   0.417           0.382
## X0762.HK                  0.115           0.129   -0.295  -0.257
## X0836.HK                  0.141           0.104
```

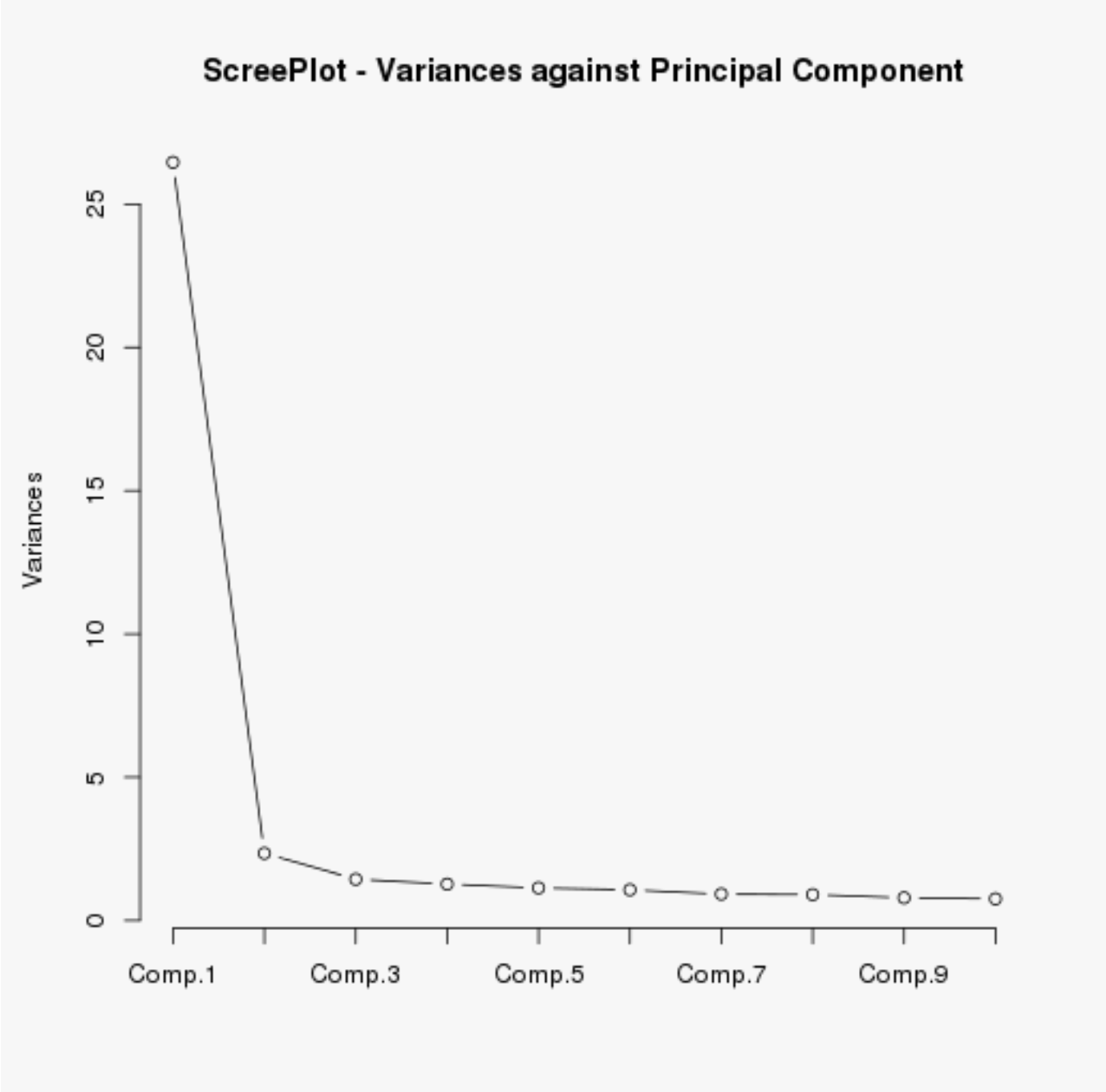
```
## X0857.HK -0.103   0.149  -0.144          -0.109   0.234   0.106
## X0883.HK -0.190   0.178           0.159          0.130          -0.211
## X0939.HK                         -0.163   0.100  -0.151
## X0941.HK  0.320                  -0.113                          0.125
## X1044.HK  0.299   0.106  -0.263                                  0.332
## X1088.HK -0.106  -0.137          -0.113  -0.208   0.284
## X1109.HK                 -0.111                                  0.132
## X1199.HK -0.261  -0.111           0.260                          -0.113
## X1299.HK  0.217                   0.421  -0.195  -0.385   0.176
## X1398.HK
## X1880.HK  0.153  -0.181          -0.132          0.229  -0.491  -0.285
## X1898.HK                          0.114   0.302   0.112          -0.323
## X2318.HK  0.175   0.108   0.132                                  -0.137
## X2388.HK          0.122   0.174  -0.189          0.146   0.172   0.155
## X2600.HK         -0.259  -0.432                  -0.232   0.197
## X2628.HK  0.101           0.316   0.181  -0.198  -0.114  -0.252   0.176
## X3328.HK
## X3988.HK                                                          0.157
##          Comp.26 Comp.27 Comp.28 Comp.29 Comp.30 Comp.31 Comp.32 Comp.33
## X0001.HK -0.216                   0.100
## X0002.HK -0.203  -0.226  -0.253          -0.220                   0.109
## X0003.HK                 -0.114           0.135           0.128
## X0004.HK -0.203   0.121   0.225  -0.369   0.194  -0.194           0.253
## X0005.HK                 -0.201   0.195   0.194  -0.161
## X0006.HK  0.126   0.117   0.189  -0.165   0.141   0.103
## X0011.HK  0.272   0.138   0.134          -0.243          0.142   0.269
## X0012.HK         -0.218           0.247   0.150  -0.114   0.165
## X0013.HK -0.111           0.358   0.317   0.235          -0.375
## X0016.HK -0.110                                  -0.132          -0.103
## X0017.HK -0.240   0.268          -0.113                  -0.179
## X0019.HK         -0.108  -0.220  -0.125   0.129          -0.127
## X0023.HK          0.427          -0.123          -0.179   0.125
## X0066.HK  0.186                           0.176   0.223  -0.158  -0.104
## X0083.HK  0.472   0.121                  -0.284          -0.195  -0.213
## X0101.HK                 -0.289  -0.130   0.162   0.447   0.132
## X0144.HK         -0.220   0.161   0.201                           0.190
## X0151.HK          0.102                  -0.192   0.243   0.101   0.149
## X0267.HK         -0.185   0.261  -0.223  -0.141   0.251   0.198
## X0291.HK                  0.140                                   0.102
## X0293.HK                 -0.101   0.122          0.173          -0.138
## X0322.HK  0.106                           0.147  -0.171  -0.133  -0.157
## X0330.HK  0.172                           0.173
## X0386.HK  0.198           0.168  -0.108  -0.176  -0.287
## X0388.HK                         -0.117  -0.103  -0.273
## X0494.HK                 -0.242          -0.166  -0.161  -0.187
## X0688.HK -0.137  -0.200  -0.116          -0.145          -0.234   0.103
## X0700.HK  0.210                           0.299           0.153
## X0762.HK                                  0.192                   -0.115
## X0836.HK                 -0.159                  -0.130
## X0857.HK -0.146   0.181          -0.206           0.125
## X0883.HK                 -0.110                   0.125  -0.186   0.509
## X0939.HK         -0.156          -0.131           0.119  -0.105
## X0941.HK -0.234                                  -0.125
## X1044.HK -0.201
## X1088.HK                  0.228                   0.138  -0.157  -0.333
## X1109.HK -0.165  -0.100  -0.131  -0.105                  -0.199  -0.189
## X1199.HK -0.115  -0.203  -0.145  -0.151   0.152           0.340  -0.346
```

```
## X1299.HK         -0.116                          0.140
## X1398.HK                         -0.107                          0.163
## X1880.HK                                        -0.100
## X1898.HK -0.241   0.112   0.154   0.320  -0.228   0.147
## X2318.HK         -0.253   0.137                          0.217
## X2388.HK                                 -0.155          0.227  -0.141
## X2600.HK          0.375           0.276                  0.206
## X2628.HK                          0.263  -0.133   0.157
## X3328.HK  0.101   0.118  -0.191
## X3988.HK  0.131                           0.176          -0.149
##           Comp.34 Comp.35 Comp.36 Comp.37 Comp.38 Comp.39 Comp.40 Comp.41
## X0001.HK                                  -0.294   0.137  -0.169   0.113
## X0002.HK  0.179                                    0.149
## X0003.HK                  0.138
## X0004.HK  0.137           0.154                   -0.329   0.127
## X0005.HK -0.155   0.228  -0.420           -0.369          0.302
## X0006.HK -0.124          -0.154
## X0011.HK -0.459                   -0.133   0.154  -0.103   0.165   0.131
## X0012.HK         -0.226  -0.331           0.323  -0.105
## X0013.HK                                           0.161           0.173
## X0016.HK -0.222  -0.135   0.103                                  -0.341  -0.302
## X0017.HK  0.107  -0.247  -0.111           0.140
## X0019.HK          0.145   0.111                   -0.157
## X0023.HK  0.246  -0.164  -0.117   0.142           0.288          -0.141
## X0066.HK                          -0.232                          -0.146
## X0083.HK  0.211   0.270   0.257
## X0101.HK          0.204           0.121  -0.235          -0.152
## X0144.HK  0.333   0.106                           -0.233  -0.134  -0.156
## X0151.HK                  -0.185                   0.122  -0.122
## X0267.HK                  -0.256   0.191  -0.139   0.129           0.215
## X0291.HK
## X0293.HK         -0.159
## X0322.HK
## X0330.HK
## X0386.HK         -0.124  -0.142          -0.146   0.136  -0.245
## X0388.HK          0.393           0.428   0.115   0.133  -0.163
## X0494.HK                          -0.135           0.105
## X0688.HK                                  -0.215           0.124
## X0700.HK                           0.188   0.166
## X0762.HK                          -0.125          -0.113  -0.108
## X0836.HK                                                          -0.103
## X0857.HK  0.155   0.185  -0.150  -0.148   0.229  -0.131   0.187
## X0883.HK                  0.233           0.188   0.140
## X0939.HK -0.231                   0.111           0.142   0.328  -0.333
## X0941.HK -0.174   0.197                                           0.167
## X1044.HK                  0.159
## X1088.HK -0.137  -0.309   0.214   0.265                   0.278
## X1109.HK                 -0.178  -0.131   0.308  -0.132  -0.185
## X1199.HK -0.161           0.238                                   0.277
## X1299.HK                 -0.204
## X1398.HK         -0.162                  -0.134                  -0.284
## X1880.HK                                  0.123
## X1898.HK  0.137   0.171           0.201          -0.291
## X2318.HK  0.352                  -0.340           0.312   0.325   0.104
## X2388.HK          0.134          -0.451          -0.136  -0.191  -0.167
## X2600.HK                  0.142                    0.245
## X2628.HK         -0.169   0.174                          -0.152  -0.194
```

```
## X3328.HK         -0.325                  -0.257  -0.356           0.473
## X3988.HK                                  0.263          -0.240   0.292
##          Comp.42 Comp.43 Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## X0001.HK         -0.348   0.339   0.145   0.359   0.451
## X0002.HK          0.145          -0.170           0.105  -0.114
## X0003.HK
## X0004.HK          0.311           0.123
## X0005.HK          0.207           0.115  -0.245
## X0006.HK         -0.137
## X0011.HK -0.334                  -0.145           0.127
## X0012.HK                 -0.144   0.198   0.175  -0.138   0.137
## X0013.HK  0.140   0.167  -0.324  -0.281                   0.264
## X0016.HK -0.132                  -0.346  -0.305  -0.210  -0.317
## X0017.HK -0.165                   0.142
## X0019.HK                                  0.126
## X0023.HK                 -0.213           0.133
## X0066.HK -0.161  -0.136
## X0083.HK  0.172   0.100
## X0101.HK -0.168          -0.128
## X0144.HK         -0.146                                   -0.143
## X0151.HK -0.111   0.129  -0.100
## X0267.HK  0.290                          -0.101
## X0291.HK
## X0293.HK -0.100                          -0.101
## X0322.HK
## X0330.HK
## X0386.HK -0.196   0.242  -0.149   0.173
## X0388.HK -0.113  -0.338                           -0.175
## X0494.HK  0.167           0.125
## X0688.HK -0.246                           0.250  -0.483   0.132
## X0700.HK                  0.108
## X0762.HK -0.185  -0.103                                    0.129
## X0836.HK                                          -0.129
## X0857.HK         -0.141   0.235  -0.379   0.178           0.105
## X0883.HK         -0.217  -0.224   0.331  -0.193
## X0939.HK  0.129          -0.229  -0.182   0.296   0.169  -0.324
## X0941.HK  0.113          -0.106          -0.195
## X1044.HK
## X1088.HK         -0.159   0.125   0.246  -0.119
## X1109.HK                 -0.143          -0.300   0.426
## X1199.HK -0.125   0.127  -0.142           0.190   0.100   0.151
## X1299.HK  0.159  -0.125                   -0.148
## X1398.HK                  0.127  -0.145  -0.252   0.182   0.679
## X1880.HK                  0.156
## X1898.HK -0.274   0.126           0.173
## X2318.HK -0.248  -0.186                   -0.198          -0.132
## X2388.HK  0.290                   0.279          -0.221
## X2600.HK  0.282                                  -0.100
## X2628.HK  0.108                           0.226
## X3328.HK  0.134  -0.258  -0.234  -0.274                   -0.174
## X3988.HK          0.320   0.492                  -0.149  -0.150
##
##                Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8
## SS loadings     1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
## Proportion Var  0.021  0.021  0.021  0.021  0.021  0.021  0.021  0.021
## Cumulative Var  0.021  0.042  0.062  0.083  0.104  0.125  0.146  0.167
##                Comp.9 Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15
```

```
## SS loadings     1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var  0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var  0.188   0.208   0.229   0.250   0.271   0.292   0.313
##                Comp.16 Comp.17 Comp.18 Comp.19 Comp.20 Comp.21 Comp.22
## SS loadings      1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.333   0.354   0.375   0.396   0.417   0.438   0.458
##                Comp.23 Comp.24 Comp.25 Comp.26 Comp.27 Comp.28 Comp.29
## SS loadings      1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.479   0.500   0.521   0.542   0.563   0.583   0.604
##                Comp.30 Comp.31 Comp.32 Comp.33 Comp.34 Comp.35 Comp.36
## SS loadings      1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.625   0.646   0.667   0.688   0.708   0.729   0.750
##                Comp.37 Comp.38 Comp.39 Comp.40 Comp.41 Comp.42 Comp.43
## SS loadings      1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.771   0.792   0.813   0.833   0.854   0.875   0.896
##                Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## SS loadings      1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.917   0.938   0.958   0.979   1.000
```


Relative variance of Principal Components to HSI
0
50
100
150
200
250
300
Comp.1
Comp.4
Comp.7
Comp.10
Comp.14
Comp.18



The Cattell scree test plots the components as the X axis and the corresponding eigenvalues as the Y-axis. As one moves to the right, toward later components, the eigenvalues drop. When the drop ceases and the curve makes an elbow toward less steep decline, Cattell's scree test says to drop all further components after the one starting the elbow. This rule is sometimes criticised for being amenable to researcher-controlled "fudging". That is, as picking the "elbow" can be subjective because the curve has multiple elbows or is a smooth curve, the researcher may be tempted to set the cut-off at the number of factors desired by his or her research agenda.

5.2 PCA with psyche package principal Function

principal(...) Does an eigen value decomposition and returns eigen values, loadings, and degree of fit for a specified number of components. Basically it is just doing a principal components analysis (PCA) for n principal components of either a correlation or covariance matrix. Can show the residual correlations as well. The quality of reduction in the squared correlations is reported by comparing residual correlations to original correlations. Unlike princomp, this returns a subset of just the best nfactors. The eigen vectors are rescaled by the sqrt of the eigen values to produce the component loadings more typical in factor analysis.[6]

Rotation Methods[7] The unrotated output maximises the variance accounted for by the first and subsequent factors, and forcing the factors to be orthogonal. This data-compression comes at the cost of having most items load on the early factors, and usually, of having many items load substantially on more than one factor. Rotation serves to make the output more understandable, by seeking so-called "Simple Structure": A pattern of loadings where items load most strongly on one factor, and much more weakly on the other factors. Rotations can be orthogonal or oblique (allowing the factors to correlate).

[6] from psyche package help(principal)

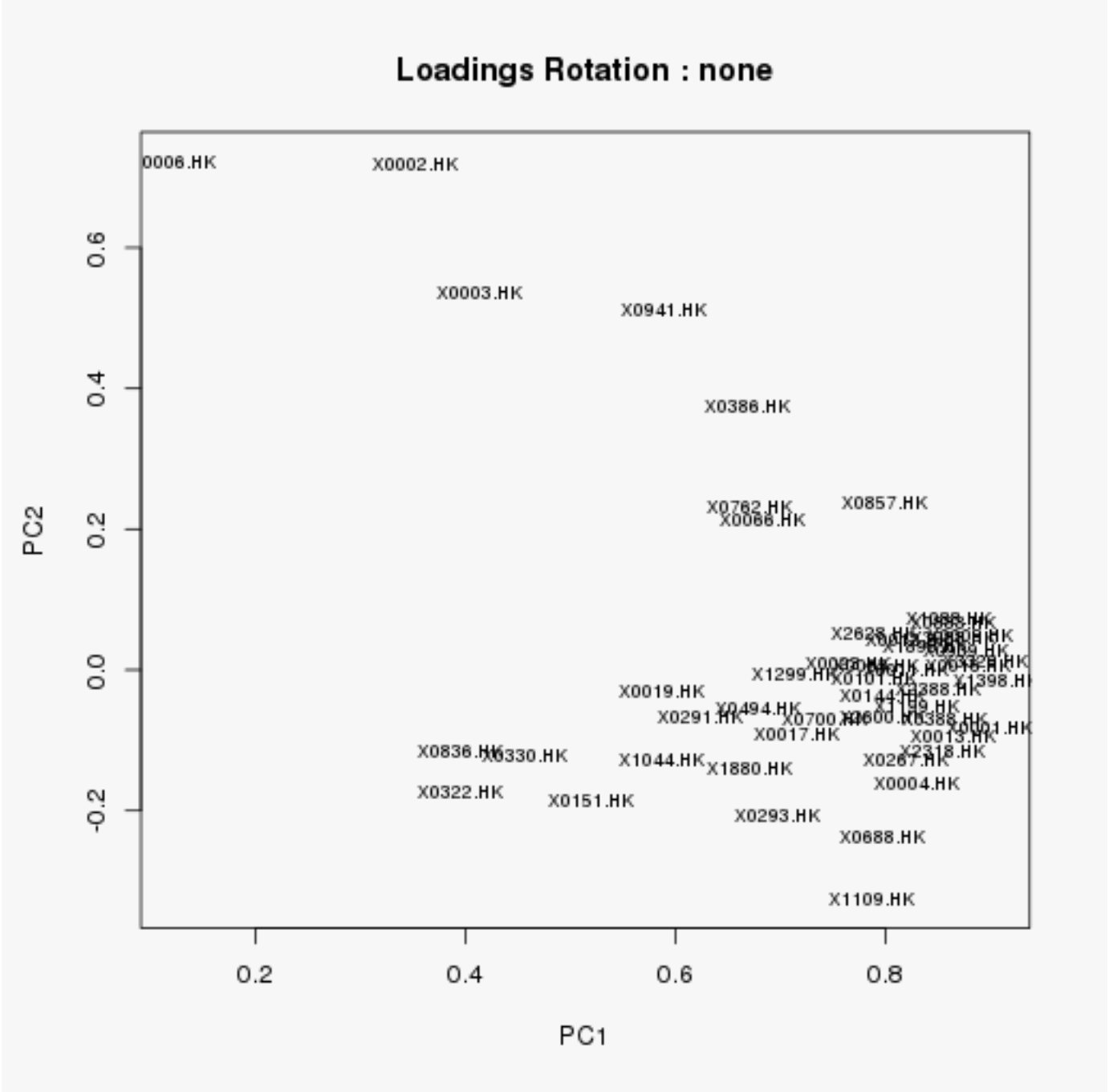
[7] http://en.wikipedia.org/wiki/Factoranalysis

5.2.1 Rotation : none

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "none")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item  PC1   PC2   PC3   PC4   PC5   h2   u2
## X1398.HK   40 0.91 -0.02 -0.07  0.05 -0.12 0.84 0.16
## X0001.HK    1 0.90 -0.08 -0.05 -0.20 -0.01 0.85 0.15
## X3328.HK   47 0.89  0.01 -0.09  0.08 -0.02 0.82 0.18
## X0005.HK    5 0.88  0.05 -0.04  0.03 -0.02 0.78 0.22
## X0016.HK   10 0.88  0.01 -0.06 -0.18 -0.04 0.81 0.19
## X0939.HK   33 0.88  0.03  0.00  0.07 -0.08 0.78 0.22
## X0013.HK    9 0.86 -0.09 -0.05 -0.14  0.04 0.78 0.22
## X0883.HK   32 0.86  0.07 -0.03  0.18 -0.03 0.79 0.21
## X3988.HK   48 0.86  0.05 -0.01  0.00 -0.04 0.75 0.25
## X1088.HK   36 0.86  0.07  0.04  0.12  0.03 0.76 0.24
## X0388.HK   25 0.86 -0.07 -0.05 -0.17 -0.02 0.77 0.23
## X2318.HK   43 0.85 -0.12 -0.11  0.00 -0.09 0.76 0.24
## X2388.HK   44 0.85 -0.03  0.05 -0.10 -0.17 0.76 0.24
## X1898.HK   42 0.84  0.03 -0.03  0.02 -0.01 0.70 0.30
## X1199.HK   38 0.83 -0.05 -0.15  0.19  0.07 0.75 0.25
## X0004.HK    4 0.83 -0.16 -0.11 -0.14 -0.02 0.75 0.25
## X0012.HK    8 0.82  0.04 -0.08 -0.21  0.04 0.73 0.27
## X0267.HK   19 0.82 -0.13  0.11 -0.11  0.09 0.72 0.28
## X0011.HK    7 0.82  0.00  0.05 -0.31 -0.06 0.77 0.23
## X0857.HK   31 0.80  0.24 -0.02  0.18  0.15 0.75 0.25
## X0144.HK   17 0.80 -0.03  0.00  0.22  0.08 0.69 0.31
## X0688.HK   27 0.80 -0.24 -0.17  0.11 -0.11 0.74 0.26
## X2600.HK   45 0.80 -0.07 -0.15  0.06 -0.10 0.68 0.32
## X0083.HK   15 0.79  0.01 -0.15 -0.16  0.02 0.67 0.33
## X0101.HK   16 0.79 -0.01 -0.20 -0.14  0.07 0.69 0.31
## X2628.HK   46 0.79  0.05 -0.02  0.04 -0.03 0.63 0.37
## X1109.HK   37 0.79 -0.33 -0.11  0.09 -0.02 0.75 0.25
## X0023.HK   13 0.76  0.01  0.10 -0.17 -0.21 0.67 0.33
## X0700.HK   28 0.74 -0.07 -0.07  0.27 -0.24 0.69 0.31
## X0017.HK   11 0.71 -0.09 -0.16 -0.18  0.11 0.59 0.41
## X1299.HK   39 0.71 -0.01  0.06 -0.06  0.04 0.52 0.48
## X0293.HK   21 0.70 -0.21 -0.03  0.01  0.03 0.53 0.47
## X0066.HK   14 0.68  0.21  0.19 -0.24  0.09 0.61 0.39
## X0494.HK   26 0.68 -0.05  0.02  0.06 -0.03 0.47 0.53
## X1880.HK   41 0.67 -0.14  0.06  0.24 -0.12 0.55 0.45
## X0762.HK   29 0.67  0.23  0.18  0.30  0.01 0.62 0.38
## X0386.HK   24 0.67  0.37 -0.08  0.32  0.20 0.74 0.26
## X0291.HK   20 0.62 -0.07 -0.07 -0.02  0.05 0.40 0.60
## X0941.HK   34 0.59  0.51  0.16  0.09  0.10 0.65 0.35
## X1044.HK   35 0.59 -0.13  0.41  0.23 -0.14 0.60 0.40
## X0019.HK   12 0.59 -0.03  0.19 -0.21  0.03 0.43 0.57
## X0006.HK    6 0.12  0.72 -0.15  0.11 -0.18 0.61 0.39
## X0002.HK    2 0.35  0.72  0.04 -0.10 -0.14 0.67 0.33
## X0003.HK    3 0.41  0.54  0.20 -0.30  0.18 0.62 0.38
## X0322.HK   22 0.39 -0.17  0.65 -0.12 -0.15 0.65 0.35
## X0151.HK   18 0.52 -0.19  0.58  0.17  0.04 0.67 0.33
## X0836.HK   30 0.40 -0.11  0.14  0.07  0.65 0.62 0.38
## X0330.HK   23 0.46 -0.12 -0.08  0.06  0.50 0.48 0.52
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    26.46 2.35 1.44 1.27 1.14
```

```
## Proportion Var  0.55 0.05 0.03 0.03 0.02
## Cumulative Var  0.55 0.60 0.63 0.66 0.68
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1


##              PC1        PC2
## X0001.HK 0.8983 -0.0817693
## X0002.HK 0.3512  0.7180853
## X0003.HK 0.4128  0.5369709
## X0004.HK 0.8285 -0.1617474
## X0005.HK 0.8809  0.0491310
## X0006.HK 0.1223  0.7224861
## X0011.HK 0.8187 -0.0005746
## X0012.HK 0.8215  0.0417690
## X0013.HK 0.8646 -0.0948814
## X0016.HK 0.8793  0.0058417
## X0017.HK 0.7145 -0.0924634
## X0019.HK 0.5869 -0.0300770
## X0023.HK 0.7647  0.0097074
## X0066.HK 0.6820  0.2139168
## X0083.HK 0.7908  0.0063879
## X0101.HK 0.7885 -0.0130336
## X0144.HK 0.7976 -0.0349502
## X0151.HK 0.5192 -0.1864148
## X0267.HK 0.8203 -0.1265697
## X0291.HK 0.6225 -0.0666064
## X0293.HK 0.6966 -0.2071688
## X0322.HK 0.3941 -0.1743734
## X0330.HK 0.4559 -0.1204225
## X0386.HK 0.6685  0.3747577
## X0388.HK 0.8563 -0.0691660
## X0494.HK 0.6794 -0.0540144
## X0688.HK 0.7964 -0.2360347
## X0700.HK 0.7427 -0.0690669
## X0762.HK 0.6701  0.2307376
## X0836.HK 0.3952 -0.1147521
## X0857.HK 0.7979  0.2391266
## X0883.HK 0.8645  0.0665429
## X0939.HK 0.8756  0.0284480
## X0941.HK 0.5890  0.5112841
## X1044.HK 0.5875 -0.1286413
## X1088.HK 0.8600  0.0719254
## X1109.HK 0.7872 -0.3251247
## X1199.HK 0.8300 -0.0506522
## X1299.HK 0.7134 -0.0074370
## X1398.HK 0.9058 -0.0155164
## X1880.HK 0.6704 -0.1392066
## X1898.HK 0.8373  0.0330820
## X2318.HK 0.8529 -0.1166457
## X2388.HK 0.8496 -0.0270018
## X2600.HK 0.7963 -0.0666486
```

```
## X2628.HK 0.7878  0.0518043
## X3328.HK 0.8946  0.0122734
## X3988.HK 0.8639  0.0462332
```



5.2.2 Rotation : varimax

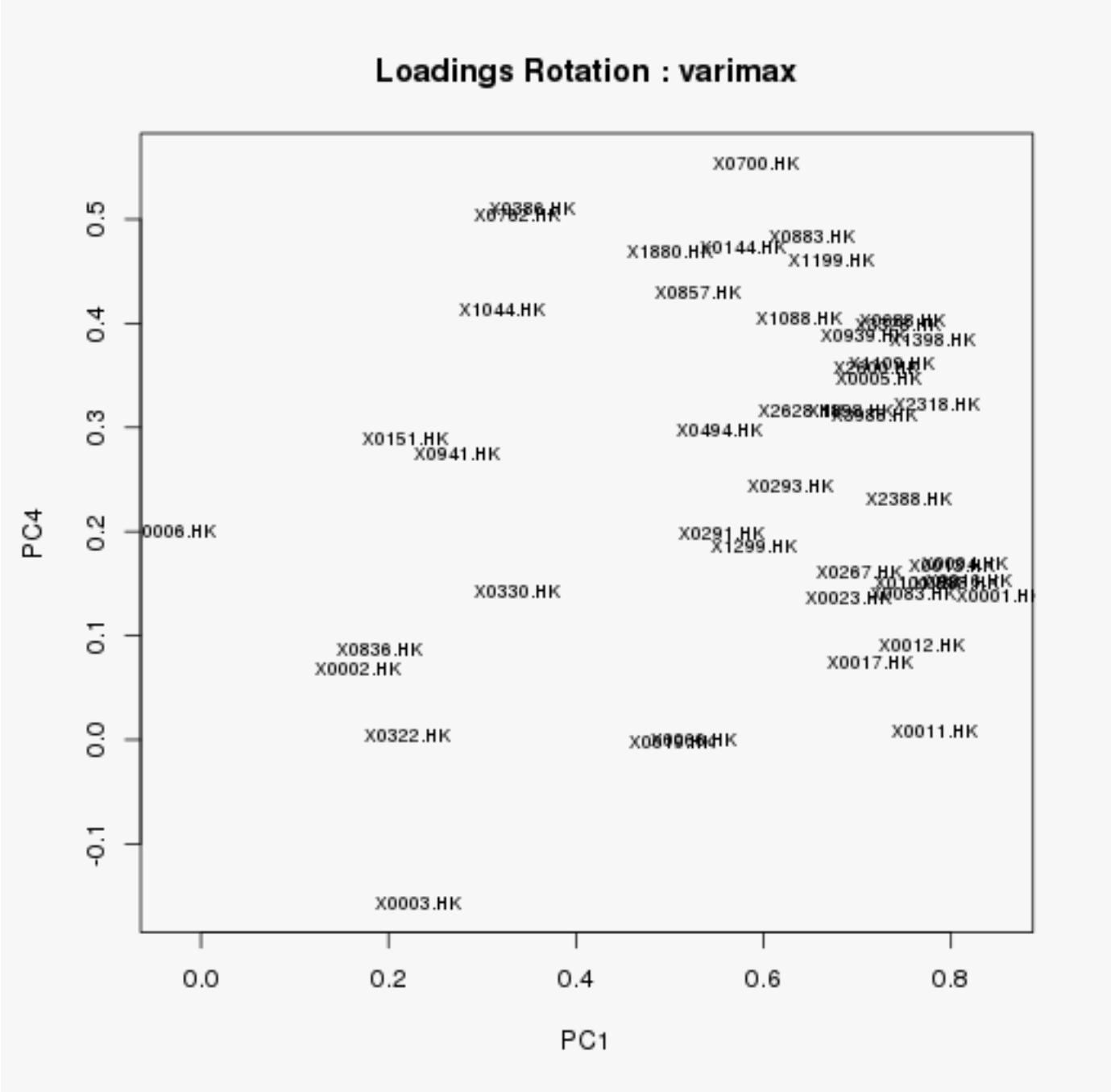
Varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix, which has the effect of differentiating the original variables by extracted factor. Each factor will tend to have either large or small loadings of any particular variable. A varimax solution yields results which make it as easy as possible to identify each variable with a single factor. This is the most common rotation option.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "varimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item   PC1   PC4   PC2   PC3   PC5   h2   u2
## X0001.HK    1  0.85  0.14  0.18  0.22  0.17 0.85 0.15
## X0016.HK   10  0.82  0.15  0.25  0.19  0.13 0.81 0.19
## X0004.HK    4  0.82  0.17  0.07  0.16  0.15 0.75 0.25
## X0388.HK   25  0.80  0.15  0.18  0.21  0.15 0.77 0.23
## X0013.HK    9  0.80  0.17  0.15  0.20  0.22 0.78 0.22
## X2318.HK   43  0.78  0.32  0.10  0.16  0.09 0.76 0.24
## X0011.HK    7  0.78  0.01  0.26  0.29  0.10 0.77 0.23
## X1398.HK   40  0.78  0.38  0.21  0.19  0.08 0.84 0.16
## X0012.HK    8  0.77  0.09  0.27  0.14  0.19 0.73 0.27
## X0101.HK   16  0.76  0.15  0.19  0.02  0.21 0.69 0.31
## X0083.HK   15  0.76  0.14  0.22  0.07  0.16 0.67 0.33
## X2388.HK   44  0.75  0.23  0.21  0.31  0.02 0.76 0.24
## X0688.HK   27  0.75  0.40 -0.05  0.11  0.08 0.74 0.26
## X3328.HK   47  0.74  0.40  0.23  0.15  0.17 0.82 0.18
## X1109.HK   37  0.74  0.36 -0.12  0.17  0.17 0.75 0.25
## X0005.HK    5  0.72  0.35  0.27  0.19  0.17 0.78 0.22
## X2600.HK   45  0.72  0.36  0.12  0.09  0.07 0.68 0.32
## X3988.HK   48  0.72  0.31  0.27  0.21  0.14 0.75 0.25
## X0017.HK   11  0.71  0.08  0.11  0.05  0.24 0.59 0.41
## X0939.HK   33  0.71  0.39  0.25  0.23  0.12 0.78 0.22
## X0267.HK   19  0.70  0.16  0.13  0.34  0.27 0.72 0.28
## X1898.HK   42  0.69  0.32  0.25  0.19  0.16 0.70 0.30
## X0023.HK   13  0.69  0.14  0.24  0.34 -0.05 0.67 0.33
## X1199.HK   38  0.67  0.46  0.13  0.07  0.25 0.75 0.25
## X0883.HK   32  0.65  0.48  0.27  0.18  0.16 0.79 0.21
## X2628.HK   46  0.64  0.32  0.25  0.18  0.14 0.63 0.37
## X1088.HK   36  0.64  0.41  0.29  0.24  0.22 0.76 0.24
## X0293.HK   21  0.63  0.24 -0.02  0.19  0.19 0.53 0.47
## X0700.HK   28  0.59  0.55  0.09  0.16 -0.04 0.69 0.31
## X1299.HK   39  0.59  0.19  0.20  0.24  0.19 0.52 0.48
## X0144.HK   17  0.58  0.47  0.15  0.19  0.27 0.69 0.31
## X0291.HK   20  0.56  0.20  0.10  0.10  0.18 0.40 0.60
## X0494.HK   26  0.55  0.30  0.12  0.21  0.13 0.47 0.53
## X0857.HK   31  0.53  0.43  0.42  0.11  0.31 0.75 0.25
## X0066.HK   14  0.53  0.00  0.44  0.32  0.21 0.61 0.39
## X0019.HK   12  0.50  0.00  0.17  0.35  0.15 0.43 0.57
## X1880.HK   41  0.50  0.47  0.02  0.27  0.07 0.55 0.45
## X0386.HK   24  0.35  0.51  0.49 -0.02  0.33 0.74 0.26
## X0762.HK   29  0.34  0.50  0.38  0.28  0.18 0.62 0.38
## X0002.HK    2  0.17  0.07  0.79  0.02 -0.12 0.67 0.33
## X0006.HK    6 -0.03  0.20  0.68 -0.23 -0.21 0.61 0.39
## X0003.HK    3  0.23 -0.16  0.68  0.18  0.21 0.62 0.38
## X0941.HK   34  0.27  0.27  0.65  0.18  0.20 0.65 0.35
## X0322.HK   22  0.22  0.00  0.03  0.77 -0.01 0.65 0.35
## X0151.HK   18  0.22  0.29  0.01  0.70  0.22 0.67 0.33
## X1044.HK   35  0.32  0.41  0.05  0.57  0.05 0.60 0.40
```

```
## X0836.HK   30  0.19  0.09  0.02  0.16  0.74 0.62 0.38
## X0330.HK   23  0.34  0.14  0.00  0.00  0.59 0.48 0.52
##
##                  PC1  PC4  PC2  PC3  PC5
## SS loadings    18.72 4.38 4.02 3.22 2.32
## Proportion Var  0.39 0.09 0.08 0.07 0.05
## Cumulative Var  0.39 0.48 0.57 0.63 0.68
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1
```

```
##                PC1       PC4
## X0001.HK  0.85219  0.137678
## X0002.HK  0.16695  0.067551
## X0003.HK  0.23228 -0.156647
## X0004.HK  0.81550  0.169142
## X0005.HK  0.72356  0.346890
## X0006.HK -0.02902  0.200841
## X0011.HK  0.78264  0.007268
## X0012.HK  0.76907  0.091094
## X0013.HK  0.80031  0.167212
## X0016.HK  0.81963  0.153542
## X0017.HK  0.71402  0.075089
## X0019.HK  0.50243 -0.002892
## X0023.HK  0.69092  0.136897
## X0066.HK  0.52573 -0.000035
## X0083.HK  0.75904  0.139914
## X0101.HK  0.76342  0.149853
## X0144.HK  0.57886  0.473339
## X0151.HK  0.21834  0.289926
## X0267.HK  0.70165  0.160100
## X0291.HK  0.55517  0.198191
## X0293.HK  0.62936  0.243734
## X0322.HK  0.22074  0.003449
## X0330.HK  0.33693  0.141761
## X0386.HK  0.35258  0.511141
## X0388.HK  0.80469  0.151258
## X0494.HK  0.55273  0.298461
## X0688.HK  0.74718  0.402807
## X0700.HK  0.59136  0.554106
## X0762.HK  0.33614  0.503390
## X0836.HK  0.18972  0.086047
## X0857.HK  0.52904  0.429051
## X0883.HK  0.65183  0.482618
## X0939.HK  0.70630  0.388629
## X0941.HK  0.27384  0.274297
## X1044.HK  0.32173  0.412996
## X1088.HK  0.63766  0.405501
## X1109.HK  0.73677  0.362210
## X1199.HK  0.67331  0.460575
## X1299.HK  0.59070  0.185399
## X1398.HK  0.77924  0.384271
```

```
## X1880.HK  0.49911  0.469838
## X1898.HK  0.69407  0.316480
## X2318.HK  0.78491  0.321769
## X2388.HK  0.75420  0.231656
## X2600.HK  0.72092  0.356465
## X2628.HK  0.63902  0.316338
## X3328.HK  0.74385  0.397988
## X3988.HK  0.71732  0.312227
```



5.2.3 Rotation : quatimax

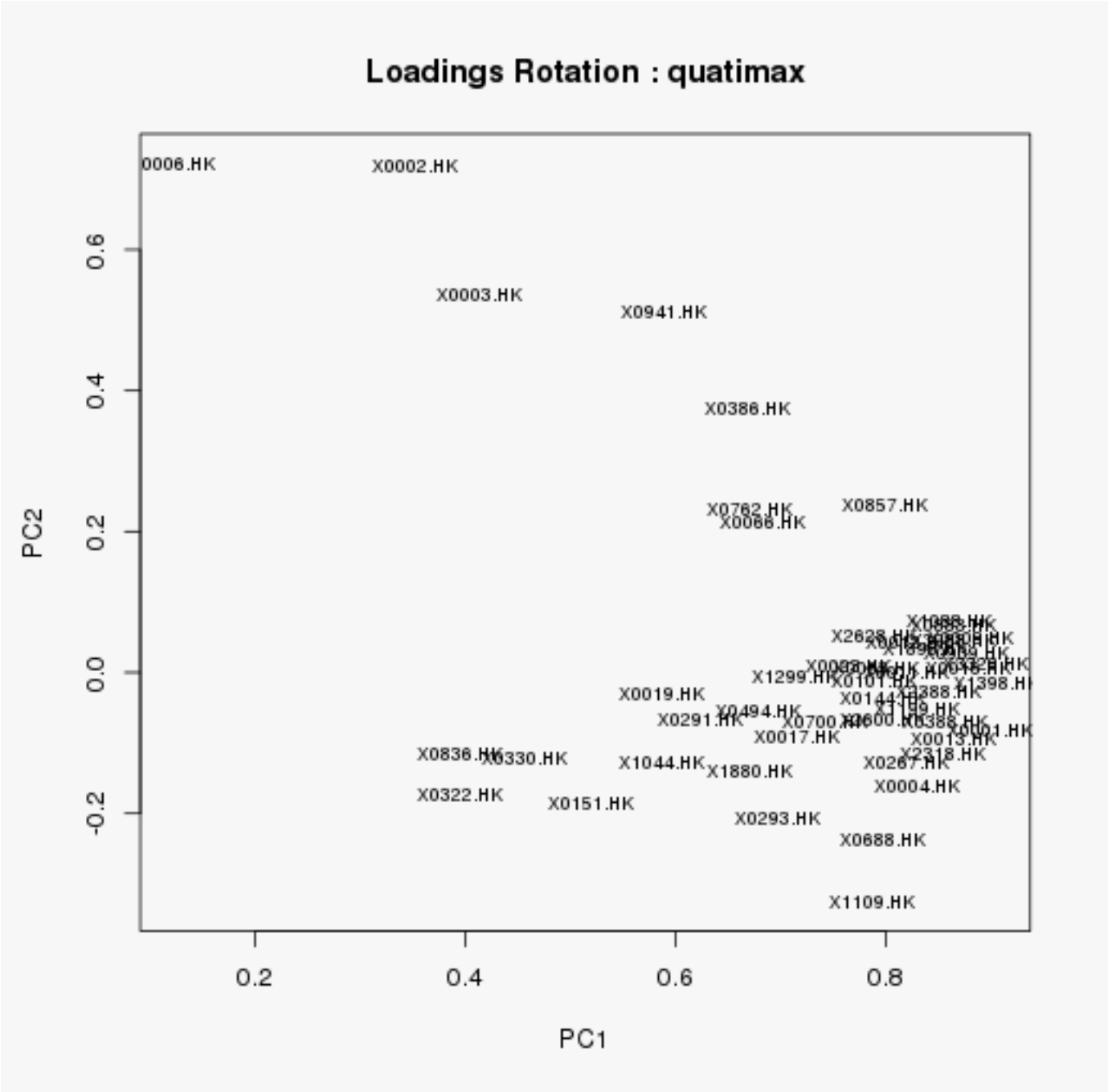
Quartimax rotation is an orthogonal alternative which minimizes the number of factors needed to explain each variable. This type of rotation often generates a general factor on which most variables are loaded to a high or medium degree. Such a factor structure is usually not helpful to the research purpose.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "quatimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item  PC1   PC2   PC3   PC4   PC5   h2   u2
## X1398.HK   40 0.91 -0.02 -0.07  0.05 -0.12 0.84 0.16
## X0001.HK    1 0.90 -0.08 -0.05 -0.20 -0.01 0.85 0.15
## X3328.HK   47 0.89  0.01 -0.09  0.08 -0.02 0.82 0.18
## X0005.HK    5 0.88  0.05 -0.04  0.03 -0.02 0.78 0.22
## X0016.HK   10 0.88  0.01 -0.06 -0.18 -0.04 0.81 0.19
## X0939.HK   33 0.88  0.03  0.00  0.07 -0.08 0.78 0.22
## X0013.HK    9 0.86 -0.09 -0.05 -0.14  0.04 0.78 0.22
## X0883.HK   32 0.86  0.07 -0.03  0.18 -0.03 0.79 0.21
## X3988.HK   48 0.86  0.05 -0.01  0.00 -0.04 0.75 0.25
## X1088.HK   36 0.86  0.07  0.04  0.12  0.03 0.76 0.24
## X0388.HK   25 0.86 -0.07 -0.05 -0.17 -0.02 0.77 0.23
## X2318.HK   43 0.85 -0.12 -0.11  0.00 -0.09 0.76 0.24
## X2388.HK   44 0.85 -0.03  0.05 -0.10 -0.17 0.76 0.24
## X1898.HK   42 0.84  0.03 -0.03  0.02 -0.01 0.70 0.30
## X1199.HK   38 0.83 -0.05 -0.15  0.19  0.07 0.75 0.25
## X0004.HK    4 0.83 -0.16 -0.11 -0.14 -0.02 0.75 0.25
## X0012.HK    8 0.82  0.04 -0.08 -0.21  0.04 0.73 0.27
## X0267.HK   19 0.82 -0.13  0.11 -0.11  0.09 0.72 0.28
## X0011.HK    7 0.82  0.00  0.05 -0.31 -0.06 0.77 0.23
## X0857.HK   31 0.80  0.24 -0.02  0.18  0.15 0.75 0.25
## X0144.HK   17 0.80 -0.03  0.00  0.22  0.08 0.69 0.31
## X0688.HK   27 0.80 -0.24 -0.17  0.11 -0.11 0.74 0.26
## X2600.HK   45 0.80 -0.07 -0.15  0.06 -0.10 0.68 0.32
## X0083.HK   15 0.79  0.01 -0.15 -0.16  0.02 0.67 0.33
## X0101.HK   16 0.79 -0.01 -0.20 -0.14  0.07 0.69 0.31
## X2628.HK   46 0.79  0.05 -0.02  0.04 -0.03 0.63 0.37
## X1109.HK   37 0.79 -0.33 -0.11  0.09 -0.02 0.75 0.25
## X0023.HK   13 0.76  0.01  0.10 -0.17 -0.21 0.67 0.33
## X0700.HK   28 0.74 -0.07 -0.07  0.27 -0.24 0.69 0.31
## X0017.HK   11 0.71 -0.09 -0.16 -0.18  0.11 0.59 0.41
## X1299.HK   39 0.71 -0.01  0.06 -0.06  0.04 0.52 0.48
## X0293.HK   21 0.70 -0.21 -0.03  0.01  0.03 0.53 0.47
## X0066.HK   14 0.68  0.21  0.19 -0.24  0.09 0.61 0.39
## X0494.HK   26 0.68 -0.05  0.02  0.06 -0.03 0.47 0.53
## X1880.HK   41 0.67 -0.14  0.06  0.24 -0.12 0.55 0.45
## X0762.HK   29 0.67  0.23  0.18  0.30  0.01 0.62 0.38
## X0386.HK   24 0.67  0.37 -0.08  0.32  0.20 0.74 0.26
## X0291.HK   20 0.62 -0.07 -0.07 -0.02  0.05 0.40 0.60
## X0941.HK   34 0.59  0.51  0.16  0.09  0.10 0.65 0.35
## X1044.HK   35 0.59 -0.13  0.41  0.23 -0.14 0.60 0.40
## X0019.HK   12 0.59 -0.03  0.19 -0.21  0.03 0.43 0.57
## X0006.HK    6 0.12  0.72 -0.15  0.11 -0.18 0.61 0.39
## X0002.HK    2 0.35  0.72  0.04 -0.10 -0.14 0.67 0.33
## X0003.HK    3 0.41  0.54  0.20 -0.30  0.18 0.62 0.38
## X0322.HK   22 0.39 -0.17  0.65 -0.12 -0.15 0.65 0.35
## X0151.HK   18 0.52 -0.19  0.58  0.17  0.04 0.67 0.33
## X0836.HK   30 0.40 -0.11  0.14  0.07  0.65 0.62 0.38
## X0330.HK   23 0.46 -0.12 -0.08  0.06  0.50 0.48 0.52
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    26.46 2.35 1.44 1.27 1.14
## Proportion Var  0.55 0.05 0.03 0.03 0.02
## Cumulative Var  0.55 0.60 0.63 0.66 0.68
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1
```

```
##              PC1        PC2
## X0001.HK 0.8983 -0.0817693
## X0002.HK 0.3512  0.7180853
## X0003.HK 0.4128  0.5369709
## X0004.HK 0.8285 -0.1617474
## X0005.HK 0.8809  0.0491310
## X0006.HK 0.1223  0.7224861
## X0011.HK 0.8187 -0.0005746
## X0012.HK 0.8215  0.0417690
## X0013.HK 0.8646 -0.0948814
## X0016.HK 0.8793  0.0058417
## X0017.HK 0.7145 -0.0924634
## X0019.HK 0.5869 -0.0300770
## X0023.HK 0.7647  0.0097074
## X0066.HK 0.6820  0.2139168
## X0083.HK 0.7908  0.0063879
## X0101.HK 0.7885 -0.0130336
## X0144.HK 0.7976 -0.0349502
## X0151.HK 0.5192 -0.1864148
## X0267.HK 0.8203 -0.1265697
## X0291.HK 0.6225 -0.0666064
## X0293.HK 0.6966 -0.2071688
## X0322.HK 0.3941 -0.1743734
## X0330.HK 0.4559 -0.1204225
## X0386.HK 0.6685  0.3747577
## X0388.HK 0.8563 -0.0691660
## X0494.HK 0.6794 -0.0540144
## X0688.HK 0.7964 -0.2360347
## X0700.HK 0.7427 -0.0690669
## X0762.HK 0.6701  0.2307376
## X0836.HK 0.3952 -0.1147521
## X0857.HK 0.7979  0.2391266
## X0883.HK 0.8645  0.0665429
## X0939.HK 0.8756  0.0284480
## X0941.HK 0.5890  0.5112841
## X1044.HK 0.5875 -0.1286413
## X1088.HK 0.8600  0.0719254
## X1109.HK 0.7872 -0.3251247
## X1199.HK 0.8300 -0.0506522
## X1299.HK 0.7134 -0.0074370
## X1398.HK 0.9058 -0.0155164
## X1880.HK 0.6704 -0.1392066
## X1898.HK 0.8373  0.0330820
```

```
## X2318.HK 0.8529 -0.1166457
## X2388.HK 0.8496 -0.0270018
## X2600.HK 0.7963 -0.0666486
## X2628.HK 0.7878  0.0518043
## X3328.HK 0.8946  0.0122734
## X3988.HK 0.8639  0.0462332
```



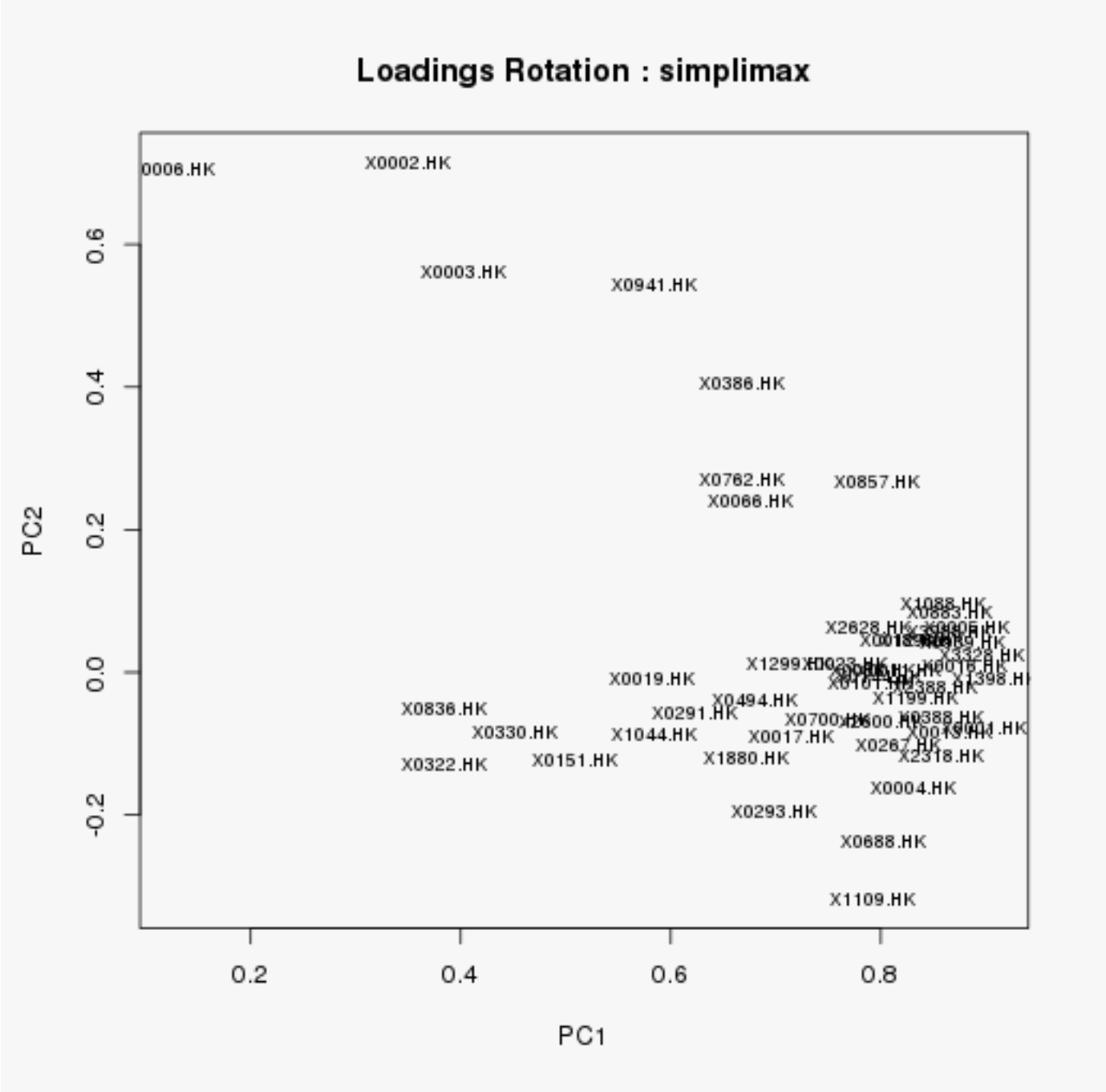
5.2.4 Rotation : simplimax

A compromise between Varimax and Quartimax criteria.

```
## Warning message: convergence not obtained in GPFoblq. 1000 iterations used.

## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "simplimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item  PC1   PC2   PC3   PC4   PC5   h2   u2
## X1398.HK   40 0.91 -0.01 -0.04 -0.02 -0.10 0.84 0.16
## X0001.HK    1 0.90 -0.08  0.01  0.21  0.02 0.85 0.15
## X3328.HK   47 0.90  0.02 -0.06 -0.06  0.00 0.82 0.18
## X0005.HK    5 0.88  0.06 -0.01 -0.01  0.00 0.78 0.22
## X0016.HK   10 0.88  0.01  0.00  0.20 -0.02 0.81 0.19
## X0939.HK   33 0.88  0.04  0.03 -0.04 -0.06 0.78 0.22
## X0883.HK   32 0.87  0.08 -0.02 -0.16 -0.01 0.79 0.21
## X3988.HK   48 0.86  0.06  0.03  0.03 -0.03 0.75 0.25
## X0013.HK    9 0.86 -0.09  0.00  0.15  0.07 0.78 0.22
## X1088.HK   36 0.86  0.10  0.07 -0.10  0.05 0.76 0.24
## X0388.HK   25 0.86 -0.06  0.01  0.18  0.00 0.77 0.23
## X2318.HK   43 0.86 -0.12 -0.08  0.01 -0.07 0.76 0.24
## X2388.HK   44 0.85 -0.02  0.10  0.14 -0.15 0.76 0.24
## X1898.HK   42 0.84  0.05  0.00  0.00  0.00 0.70 0.30
## X1199.HK   38 0.83 -0.04 -0.14 -0.19  0.09 0.75 0.25
## X0004.HK    4 0.83 -0.16 -0.07  0.15  0.00 0.75 0.25
## X0012.HK    8 0.82  0.05 -0.02  0.23  0.06 0.73 0.27
## X0011.HK    7 0.82  0.00  0.12  0.34 -0.04 0.77 0.23
## X0267.HK   19 0.82 -0.10  0.15  0.11  0.12 0.72 0.28
## X0688.HK   27 0.80 -0.24 -0.15 -0.10 -0.08 0.74 0.26
## X2600.HK   45 0.80 -0.07 -0.13 -0.04 -0.08 0.68 0.32
## X0144.HK   17 0.80 -0.01  0.01 -0.22  0.10 0.69 0.31
## X0857.HK   31 0.80  0.27 -0.01 -0.17  0.16 0.75 0.25
## X0083.HK   15 0.79  0.00 -0.10  0.17  0.03 0.67 0.33
## X1109.HK   37 0.79 -0.32 -0.10 -0.10  0.01 0.75 0.25
## X0101.HK   16 0.79 -0.02 -0.15  0.14  0.08 0.69 0.31
## X2628.HK   46 0.79  0.06  0.01 -0.01 -0.01 0.63 0.37
## X0023.HK   13 0.76  0.01  0.16  0.22 -0.19 0.67 0.33
## X0700.HK   28 0.75 -0.07 -0.07 -0.24 -0.22 0.69 0.31
## X0017.HK   11 0.72 -0.09 -0.11  0.17  0.13 0.59 0.41
## X1299.HK   39 0.71  0.01  0.10  0.07  0.06 0.52 0.48
## X0293.HK   21 0.70 -0.19 -0.01 -0.01  0.05 0.53 0.47
## X0494.HK   26 0.68 -0.04  0.04 -0.05 -0.01 0.47 0.53
## X0066.HK   14 0.68  0.24  0.25  0.26  0.11 0.61 0.39
## X1880.HK   41 0.67 -0.12  0.06 -0.22 -0.09 0.55 0.45
## X0386.HK   24 0.67  0.40 -0.08 -0.31  0.20 0.74 0.26
## X0762.HK   29 0.67  0.27  0.18 -0.27  0.02 0.62 0.38
## X0291.HK   20 0.62 -0.06 -0.05  0.02  0.07 0.40 0.60
## X0941.HK   34 0.58  0.54  0.19 -0.05  0.10 0.65 0.35
## X1044.HK   35 0.58 -0.09  0.41 -0.20 -0.11 0.60 0.40
## X0019.HK   12 0.58 -0.01  0.24  0.22  0.05 0.43 0.57
## X0002.HK    2 0.35  0.72  0.09  0.18 -0.15 0.67 0.33
## X0006.HK    6 0.13  0.70 -0.14 -0.04 -0.21 0.61 0.39
## X0003.HK    3 0.40  0.56  0.27  0.33  0.18 0.62 0.38
## X0322.HK   22 0.38 -0.13  0.69  0.16 -0.12 0.65 0.35
## X0151.HK   18 0.51 -0.12  0.59 -0.16  0.07 0.67 0.33
## X0836.HK   30 0.38 -0.05  0.14 -0.15  0.68 0.62 0.38
## X0330.HK   23 0.45 -0.08 -0.07 -0.13  0.51 0.48 0.52
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    26.43 2.34 1.46 1.28 1.15
## Proportion Var  0.55 0.05 0.03 0.03 0.02
## Cumulative Var  0.55 0.60 0.63 0.66 0.68
##
##  With component correlations of
##       PC1   PC2   PC3   PC4   PC5
## PC1  1.00 -0.01 -0.02 -0.01 -0.01
## PC2 -0.01  1.00 -0.10 -0.01 -0.03
## PC3 -0.02 -0.10  1.00 -0.15 -0.03
## PC4 -0.01 -0.01 -0.15  1.00  0.13
## PC5 -0.01 -0.03 -0.03  0.13  1.00
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1

##             PC1       PC2
## X0001.HK 0.8988 -0.076624
## X0002.HK 0.3495  0.715110
## X0003.HK 0.4034  0.561190
## X0004.HK 0.8309 -0.161793
## X0005.HK 0.8821  0.062405
## X0006.HK 0.1260  0.704491
## X0011.HK 0.8171  0.003598
## X0012.HK 0.8214  0.045515
## X0013.HK 0.8647 -0.085143
## X0016.HK 0.8803  0.007879
## X0017.HK 0.7156 -0.090933
## X0019.HK 0.5821 -0.009851
## X0023.HK 0.7649  0.012323
## X0066.HK 0.6754  0.238892
## X0083.HK 0.7929  0.004176
## X0101.HK 0.7909 -0.015150
## X0144.HK 0.7978 -0.006960
## X0151.HK 0.5090 -0.121877
## X0267.HK 0.8169 -0.100807
## X0291.HK 0.6234 -0.058224
## X0293.HK 0.6975 -0.194391
## X0322.HK 0.3837 -0.129520
## X0330.HK 0.4513 -0.083795
## X0386.HK 0.6677  0.404785
## X0388.HK 0.8570 -0.064299
## X0494.HK 0.6801 -0.039588
## X0688.HK 0.8025 -0.237412
## X0700.HK 0.7489 -0.065951
## X0762.HK 0.6673  0.268781
## X0836.HK 0.3843 -0.051708
## X0857.HK 0.7965  0.268078
## X0883.HK 0.8663  0.084531
## X0939.HK 0.8771  0.042103
## X0941.HK 0.5835  0.543885
```

```
## X1044.HK 0.5832 -0.085874
## X1088.HK 0.8593  0.097180
## X1109.HK 0.7913 -0.317449
## X1199.HK 0.8331 -0.035934
## X1299.HK 0.7116  0.010772
## X1398.HK 0.9092 -0.010349
## X1880.HK 0.6725 -0.120504
## X1898.HK 0.8383  0.045639
## X2318.HK 0.8569 -0.115736
## X2388.HK 0.8506 -0.021605
## X2600.HK 0.8012 -0.068438
## X2628.HK 0.7886  0.064543
## X3328.HK 0.8971  0.023172
## X3988.HK 0.8647  0.058327
```


Loadings Rotation : simplimax
0006.HK
X0002.HK
X0003.HK
X0941.HK
X0386.HK
X0762.HK
X0857.HK
X0066.HK
X1088.HK
X0883.HK
X2628.HK
X0019.HK
X0494.HK
X0836.HK
X0291.HK
X0330.HK
X1044.HK
X0017.HK
X0322.HK
X0151.HK
X1880.HK
X1199.HK
X2318.HK
X0004.HK
X0293.HK
X0688.HK
X1109.HK
PC2
PC1
0.6
0.4
0.2
0.0
-0.2
0.2
0.4
0.6
0.8

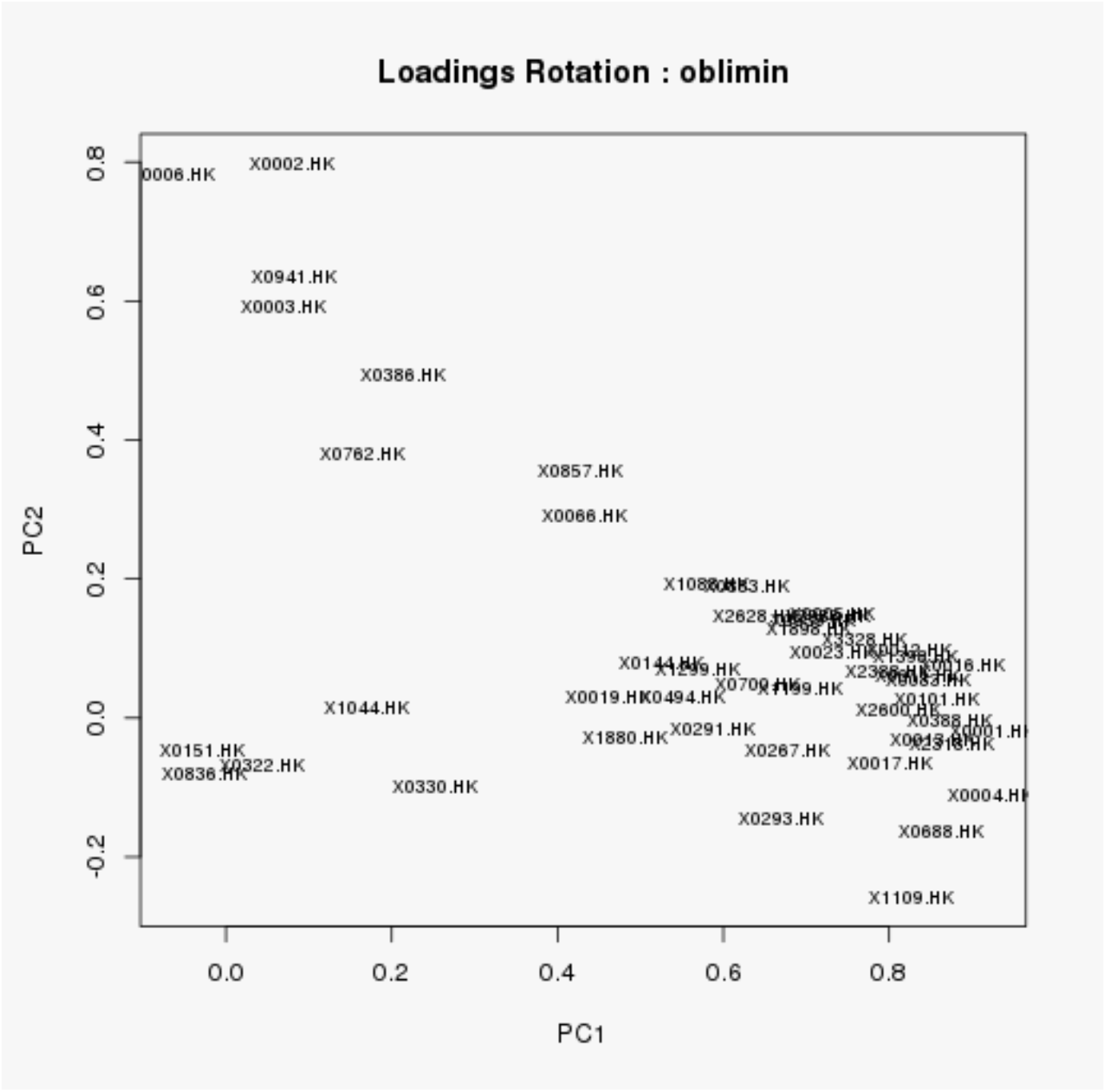
5.2.5 Rotation : oblimin

Direct oblimin rotation is the standard method when one wishes a non-orthogonal (oblique) solution – that is, one in which the factors are allowed to be correlated. This will result in higher eigenvalues but diminished interpretability of the factors.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "oblimin")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item   PC1   PC2   PC3   PC5   PC4   h2   u2
## X0001.HK    1  0.93 -0.02  0.02  0.02 -0.13 0.85 0.15
## X0004.HK    4  0.92 -0.11 -0.03  0.00 -0.06 0.75 0.25
## X0016.HK   10  0.89  0.08  0.00 -0.02 -0.11 0.81 0.19
## X2318.HK   43  0.88 -0.04  0.01 -0.03  0.10 0.76 0.24
## X0388.HK   25  0.87  0.00  0.03  0.01 -0.10 0.77 0.23
## X0688.HK   27  0.86 -0.16 -0.01 -0.03  0.22 0.74 0.26
## X0101.HK   16  0.86  0.03 -0.17  0.09 -0.07 0.69 0.31
## X0013.HK    9  0.85 -0.03  0.02  0.08 -0.09 0.78 0.22
## X0083.HK   15  0.85  0.06 -0.11  0.03 -0.09 0.67 0.33
## X0011.HK    7  0.83  0.06  0.10 -0.06 -0.26 0.77 0.23
## X1398.HK   40  0.83  0.09  0.07 -0.04  0.13 0.84 0.16
## X1109.HK   37  0.83 -0.26  0.04  0.06  0.18 0.75 0.25
## X0012.HK    8  0.82  0.10 -0.05  0.06 -0.17 0.73 0.27
## X2600.HK   45  0.81  0.01 -0.04 -0.04  0.15 0.68 0.32
## X0017.HK   11  0.80 -0.07 -0.14  0.13 -0.13 0.59 0.41
## X2388.HK   44  0.80  0.07  0.17 -0.12 -0.02 0.76 0.24
## X3328.HK   47  0.77  0.11  0.03  0.07  0.14 0.82 0.18
## X0023.HK   13  0.73  0.10  0.20 -0.19 -0.11 0.67 0.33
## X0005.HK    5  0.73  0.15  0.06  0.07  0.08 0.78 0.22
## X3988.HK   48  0.73  0.15  0.09  0.03  0.05 0.75 0.25
## X0939.HK   33  0.71  0.14  0.13  0.02  0.13 0.78 0.22
## X1898.HK   42  0.70  0.13  0.06  0.06  0.06 0.70 0.30
## X1199.HK   38  0.69  0.04 -0.03  0.19  0.24 0.75 0.25
## X0267.HK   19  0.68 -0.05  0.19  0.16 -0.11 0.72 0.28
## X0293.HK   21  0.67 -0.15  0.07  0.10  0.05 0.53 0.47
## X0700.HK   28  0.64  0.05  0.13 -0.12  0.37 0.69 0.31
## X2628.HK   46  0.64  0.15  0.08  0.05  0.08 0.63 0.37
## X0883.HK   32  0.63  0.19  0.11  0.09  0.23 0.79 0.21
## X0291.HK   20  0.59 -0.01 -0.01  0.10  0.02 0.40 0.60
## X1088.HK   36  0.58  0.19  0.16  0.15  0.13 0.76 0.24
## X1299.HK   39  0.57  0.07  0.13  0.10 -0.05 0.52 0.48
## X0494.HK   26  0.55  0.03  0.13  0.05  0.10 0.47 0.53
## X0144.HK   17  0.52  0.08  0.14  0.22  0.24 0.69 0.31
## X1880.HK   41  0.48 -0.03  0.24  0.01  0.29 0.55 0.45
## X0019.HK   12  0.46  0.03  0.23  0.05 -0.22 0.43 0.57
## X0066.HK   14  0.43  0.29  0.19  0.12 -0.28 0.61 0.39
## X0857.HK   31  0.43  0.36  0.05  0.28  0.16 0.75 0.25
## X0002.HK    2  0.08  0.80 -0.01 -0.13 -0.11 0.67 0.33
## X0006.HK    6 -0.06  0.78 -0.20 -0.17  0.13 0.61 0.39
## X0941.HK   34  0.08  0.63  0.18  0.20  0.02 0.65 0.35
## X0003.HK    3  0.07  0.59  0.10  0.18 -0.39 0.62 0.38
## X0386.HK   24  0.21  0.49 -0.03  0.36  0.28 0.74 0.26
## X0762.HK   29  0.17  0.38  0.31  0.17  0.26 0.62 0.38
## X0322.HK   22  0.04 -0.07  0.80 -0.10 -0.19 0.65 0.35
## X0151.HK   18 -0.03 -0.05  0.77  0.19  0.07 0.67 0.33
## X1044.HK   35  0.17  0.02  0.62  0.01  0.21 0.60 0.40
## X0836.HK   30 -0.02 -0.08  0.12  0.78 -0.09 0.62 0.38
## X0330.HK   23  0.25 -0.10 -0.09  0.59 -0.01 0.48 0.52
```

```
##
##                  PC1  PC2  PC3  PC5  PC4
## SS loadings    21.96 3.58 3.21 2.39 1.52
## Proportion Var  0.46 0.07 0.07 0.05 0.03
## Cumulative Var  0.46 0.53 0.60 0.65 0.68
##
##  With component correlations of
##      PC1  PC2  PC3  PC5  PC4
## PC1 1.00 0.38 0.51 0.46 0.17
## PC2 0.38 1.00 0.17 0.16 0.04
## PC3 0.51 0.17 1.00 0.24 0.06
## PC5 0.46 0.16 0.24 1.00 0.09
## PC4 0.17 0.04 0.06 0.09 1.00
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1

##                PC1       PC2
## X0001.HK  0.92552 -0.017716
## X0002.HK  0.08093  0.798243
## X0003.HK  0.06847  0.593454
## X0004.HK  0.92160 -0.110113
## X0005.HK  0.73033  0.150504
## X0006.HK -0.06356  0.782645
## X0011.HK  0.83472  0.059414
## X0012.HK  0.82490  0.096286
## X0013.HK  0.85290 -0.030149
## X0016.HK  0.88904  0.075271
## X0017.HK  0.79995 -0.065967
## X0019.HK  0.46147  0.029097
## X0023.HK  0.73209  0.095206
## X0066.HK  0.43256  0.291650
## X0083.HK  0.84661  0.055146
## X0101.HK  0.85778  0.028550
## X0144.HK  0.52411  0.077787
## X0151.HK -0.02962 -0.047074
## X0267.HK  0.67683 -0.047646
## X0291.HK  0.58772 -0.014800
## X0293.HK  0.66875 -0.145767
## X0322.HK  0.04407 -0.069161
## X0330.HK  0.25300 -0.099485
## X0386.HK  0.21440  0.493989
## X0388.HK  0.87213 -0.004147
## X0494.HK  0.55085  0.030266
## X0688.HK  0.86341 -0.162961
## X0700.HK  0.64030  0.047113
## X0762.HK  0.16593  0.379787
## X0836.HK -0.02484 -0.079500
## X0857.HK  0.42790  0.356239
## X0883.HK  0.62859  0.188417
## X0939.HK  0.70919  0.140547
## X0941.HK  0.08223  0.633945
```

```
## X1044.HK  0.16853  0.016206
## X1088.HK  0.58024  0.191583
## X1109.HK  0.82760 -0.257762
## X1199.HK  0.69225  0.041594
## X1299.HK  0.56985  0.069508
## X1398.HK  0.83283  0.087577
## X1880.HK  0.48223 -0.028467
## X1898.HK  0.70318  0.127443
## X2318.HK  0.87508 -0.037925
## X2388.HK  0.79894  0.067415
## X2600.HK  0.81053  0.011090
## X2628.HK  0.63822  0.146503
## X3328.HK  0.77017  0.113174
## X3988.HK  0.72664  0.145782
```


Loadings Rotation : oblimin
PC2
PC1
0.8
0.6
0.4
0.2
0.0
-0.2
0.0
0.2
0.4
0.6
0.8
X0002.HK
X0941.HK
X0003.HK
X0386.HK
X0762.HK
X0857.HK
X0066.HK
X1044.HK
X0151.HK
X0322.HK
X0330.HK
X0494.HK
X0291.HK
X1880.HK
X0267.HK
X0017.HK
X0293.HK
X0688.HK
X1109.HK

5.2.6 Rotation : promax

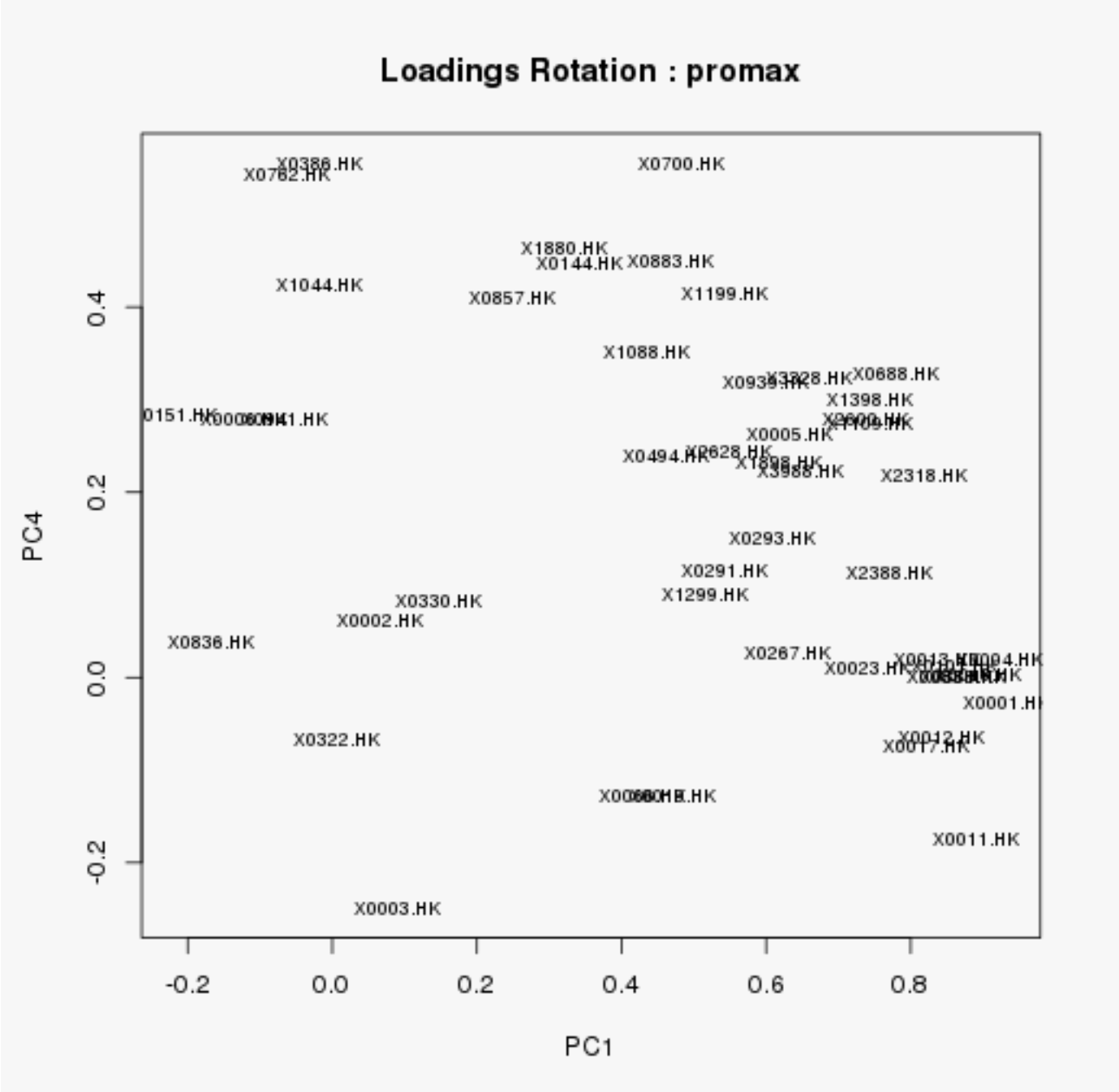
Promax rotation is an alternative non-orthogonal (oblique) rotation method which is computationally faster than the direct oblimin method and therefore is sometimes used for very large datasets.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "promax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item   PC1   PC4   PC2   PC3   PC5   h2   u2
## X0001.HK    1  0.93 -0.03  0.00  0.01  0.01 0.85 0.15
## X0004.HK    4  0.92  0.02 -0.11 -0.05 -0.01 0.75 0.25
## X0016.HK   10  0.89  0.00  0.09 -0.02 -0.05 0.81 0.19
## X0011.HK    7  0.89 -0.17  0.11  0.11 -0.07 0.77 0.23
## X0388.HK   25  0.87  0.00  0.00  0.01 -0.01 0.77 0.23
## X0101.HK   16  0.86  0.01  0.03 -0.20  0.07 0.69 0.31
## X0083.HK   15  0.85  0.00  0.06 -0.14  0.01 0.67 0.33
## X0012.HK    8  0.84 -0.06  0.12 -0.07  0.05 0.73 0.27
## X0013.HK    9  0.84  0.02 -0.03  0.00  0.08 0.78 0.22
## X0017.HK   11  0.82 -0.07 -0.06 -0.15  0.14 0.59 0.41
## X2318.HK   43  0.82  0.22 -0.08 -0.04 -0.08 0.76 0.24
## X0688.HK   27  0.78  0.33 -0.23 -0.07 -0.08 0.74 0.26
## X2388.HK   44  0.77  0.11  0.06  0.15 -0.18 0.76 0.24
## X1398.HK   40  0.74  0.30  0.04  0.01 -0.11 0.84 0.16
## X1109.HK   37  0.74  0.27 -0.33 -0.01  0.04 0.75 0.25
## X0023.HK   13  0.74  0.01  0.12  0.21 -0.24 0.67 0.33
## X2600.HK   45  0.74  0.28 -0.04 -0.09 -0.09 0.68 0.32
## X3328.HK   47  0.66  0.32  0.06 -0.04  0.01 0.82 0.18
## X3988.HK   48  0.65  0.22  0.12  0.04 -0.02 0.75 0.25
## X0005.HK    5  0.63  0.26  0.11  0.00  0.01 0.78 0.22
## X0267.HK   19  0.63  0.03 -0.05  0.18  0.16 0.72 0.28
## X1898.HK   42  0.62  0.23  0.09  0.01  0.02 0.70 0.30
## X0293.HK   21  0.61  0.15 -0.18  0.05  0.09 0.53 0.47
## X0939.HK   33  0.60  0.32  0.09  0.07 -0.05 0.78 0.22
## X2628.HK   46  0.55  0.24  0.11  0.02  0.00 0.63 0.37
## X1199.HK   38  0.54  0.42 -0.05 -0.12  0.13 0.75 0.25
## X0291.HK   20  0.54  0.12 -0.04 -0.05  0.09 0.40 0.60
## X1299.HK   39  0.52  0.09  0.06  0.10  0.08 0.52 0.48
## X0019.HK   12  0.47 -0.13  0.07  0.25  0.06 0.43 0.57
## X0883.HK   32  0.47  0.45  0.11  0.02  0.01 0.79 0.21
## X0494.HK   26  0.46  0.24 -0.01  0.08  0.01 0.47 0.53
## X1088.HK   36  0.43  0.35  0.13  0.09  0.09 0.76 0.24
## X0066.HK   14  0.43 -0.13  0.34  0.19  0.12 0.61 0.39
## X0386.HK   24 -0.02  0.56  0.39 -0.17  0.27 0.74 0.26
## X0700.HK   28  0.48  0.56 -0.05  0.04 -0.22 0.69 0.31
## X0762.HK   29 -0.06  0.54  0.29  0.21  0.08 0.62 0.38
## X1880.HK   41  0.32  0.46 -0.12  0.18 -0.06 0.55 0.45
## X0144.HK   17  0.34  0.45 -0.01  0.05  0.17 0.69 0.31
## X0857.HK   31  0.25  0.41  0.29 -0.05  0.22 0.75 0.25
## X0002.HK    2  0.06  0.06  0.84 -0.05 -0.23 0.67 0.33
## X0006.HK    6 -0.12  0.28  0.78 -0.28 -0.30 0.61 0.39
## X0003.HK    3  0.09 -0.25  0.68  0.10  0.18 0.62 0.38
## X0941.HK   34 -0.07  0.28  0.61  0.10  0.13 0.65 0.35
## X0322.HK   22  0.00 -0.07 -0.04  0.86 -0.09 0.65 0.35
## X0151.HK   18 -0.22  0.28 -0.10  0.76  0.19 0.67 0.33
## X1044.HK   35 -0.02  0.42 -0.06  0.59 -0.05 0.60 0.40
## X0836.HK   30 -0.17  0.04 -0.12  0.08  0.87 0.62 0.38
## X0330.HK   23  0.15  0.08 -0.15 -0.14  0.65 0.48 0.52
##
```

```
##                  PC1  PC4  PC2  PC3  PC5
## SS loadings    19.37 5.84 3.19 2.40 1.87
## Proportion Var  0.40 0.12 0.07 0.05 0.04
## Cumulative Var  0.40 0.53 0.59 0.64 0.68
##
##  With component correlations of
##      PC1  PC4  PC2  PC3  PC5
## PC1 1.00 0.61 0.44 0.57 0.60
## PC4 0.61 1.00 0.28 0.34 0.39
## PC2 0.44 0.28 1.00 0.28 0.36
## PC3 0.57 0.34 0.28 1.00 0.38
## PC5 0.60 0.39 0.36 0.38 1.00
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  51.99 0.3
## The degrees of freedom for the model are 898  and the objective function was  10.05
##  0.3The number of observations was  167  with Chi Square =  1465  with prob <  5.7e-30
##  0.3
## Fit based upon off diagonal values = 1
```

```
##                PC1        PC4
## X0001.HK  0.933380 -0.0281699
## X0002.HK  0.064735  0.0613040
## X0003.HK  0.090857 -0.2489061
## X0004.HK  0.924592  0.0202227
## X0005.HK  0.633652  0.2633297
## X0006.HK -0.121721  0.2797498
## X0011.HK  0.889684 -0.1736889
## X0012.HK  0.841261 -0.0643078
## X0013.HK  0.836472  0.0188537
## X0016.HK  0.892987  0.0021728
## X0017.HK  0.820643 -0.0733456
## X0019.HK  0.471035 -0.1284082
## X0023.HK  0.739785  0.0107428
## X0066.HK  0.427603 -0.1271897
## X0083.HK  0.854417  0.0008506
## X0101.HK  0.859834  0.0119355
## X0144.HK  0.342816  0.4480283
## X0151.HK -0.217530  0.2839953
## X0267.HK  0.629796  0.0258820
## X0291.HK  0.541169  0.1155293
## X0293.HK  0.607996  0.1509393
## X0322.HK  0.004841 -0.0680380
## X0330.HK  0.148175  0.0835619
## X0386.HK -0.016512  0.5552246
## X0388.HK  0.871951  0.0001927
## X0494.HK  0.460518  0.2396139
## X0688.HK  0.779172  0.3280179
## X0700.HK  0.482209  0.5551968
## X0762.HK -0.062689  0.5430906
## X0836.HK -0.166801  0.0376342
## X0857.HK  0.249120  0.4091364
## X0883.HK  0.467733  0.4486058
## X0939.HK  0.598105  0.3190360
## X0941.HK -0.065322  0.2780020
## X1044.HK -0.018575  0.4239274
```

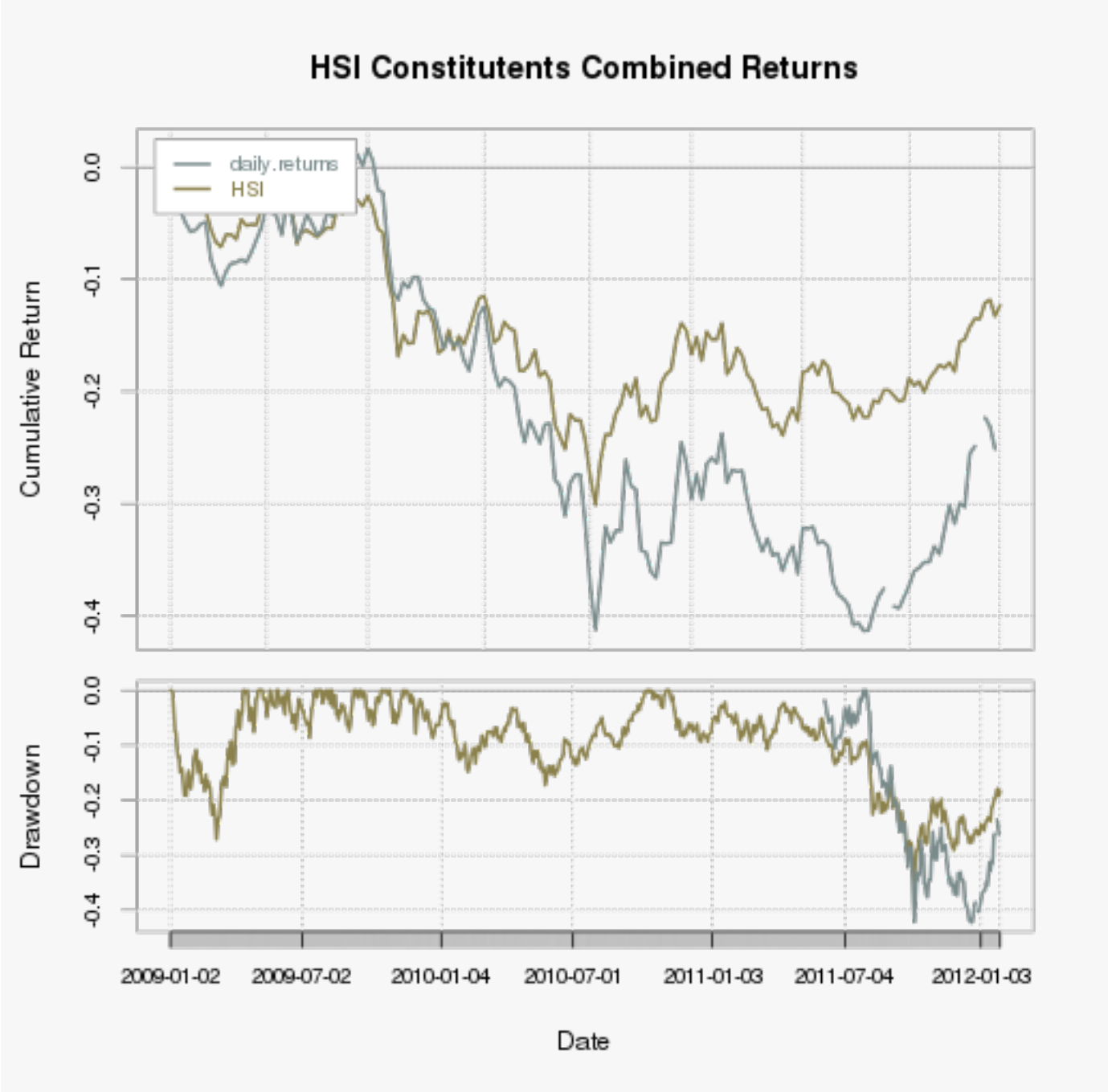
```
## X1088.HK  0.434018  0.3524840
## X1109.HK  0.742265  0.2742813
## X1199.HK  0.543598  0.4150771
## X1299.HK  0.515884  0.0885519
## X1398.HK  0.744771  0.2991204
## X1880.HK  0.321690  0.4634707
## X1898.HK  0.617204  0.2319841
## X2318.HK  0.818382  0.2191378
## X2388.HK  0.769810  0.1131562
## X2600.HK  0.738844  0.2794988
## X2628.HK  0.547969  0.2448288
## X3328.HK  0.660029  0.3229152
## X3988.HK  0.646019  0.2216809
```



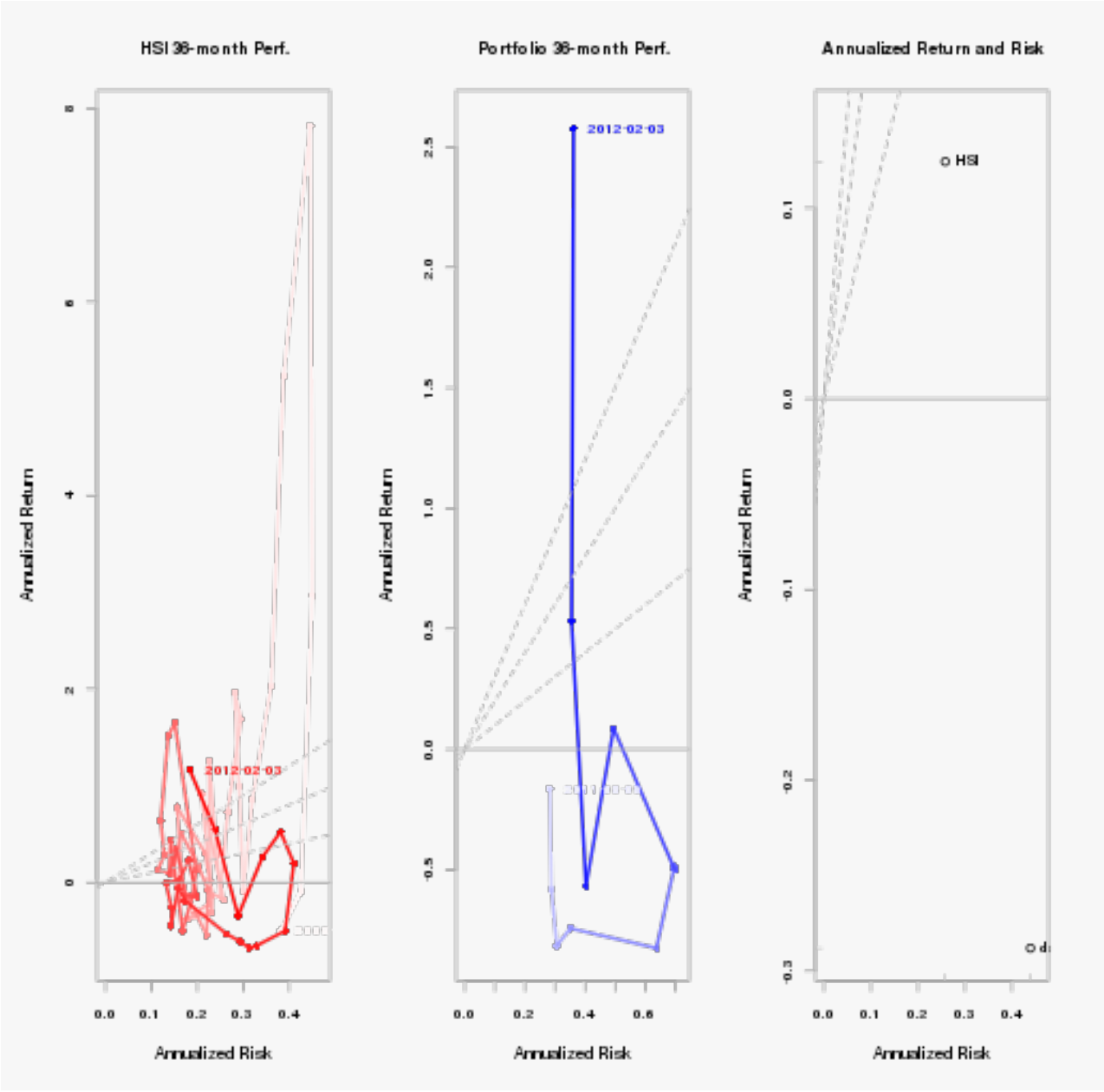
PCA is a science in itself and can not be fully covered and even less interpreted in this paper. The factors produced by principal component analysis are conceptualized as being linear combinations of the variables whereas the factors produced by common factor analysis are conceptualized as being latent variables. Note : Kaiser criterion: The Kaiser rule is to drop all components with eigenvalues under 1.0 – this being the eigenvalue equal to the information accounted for by an average single item.

6 HSI Components Performance

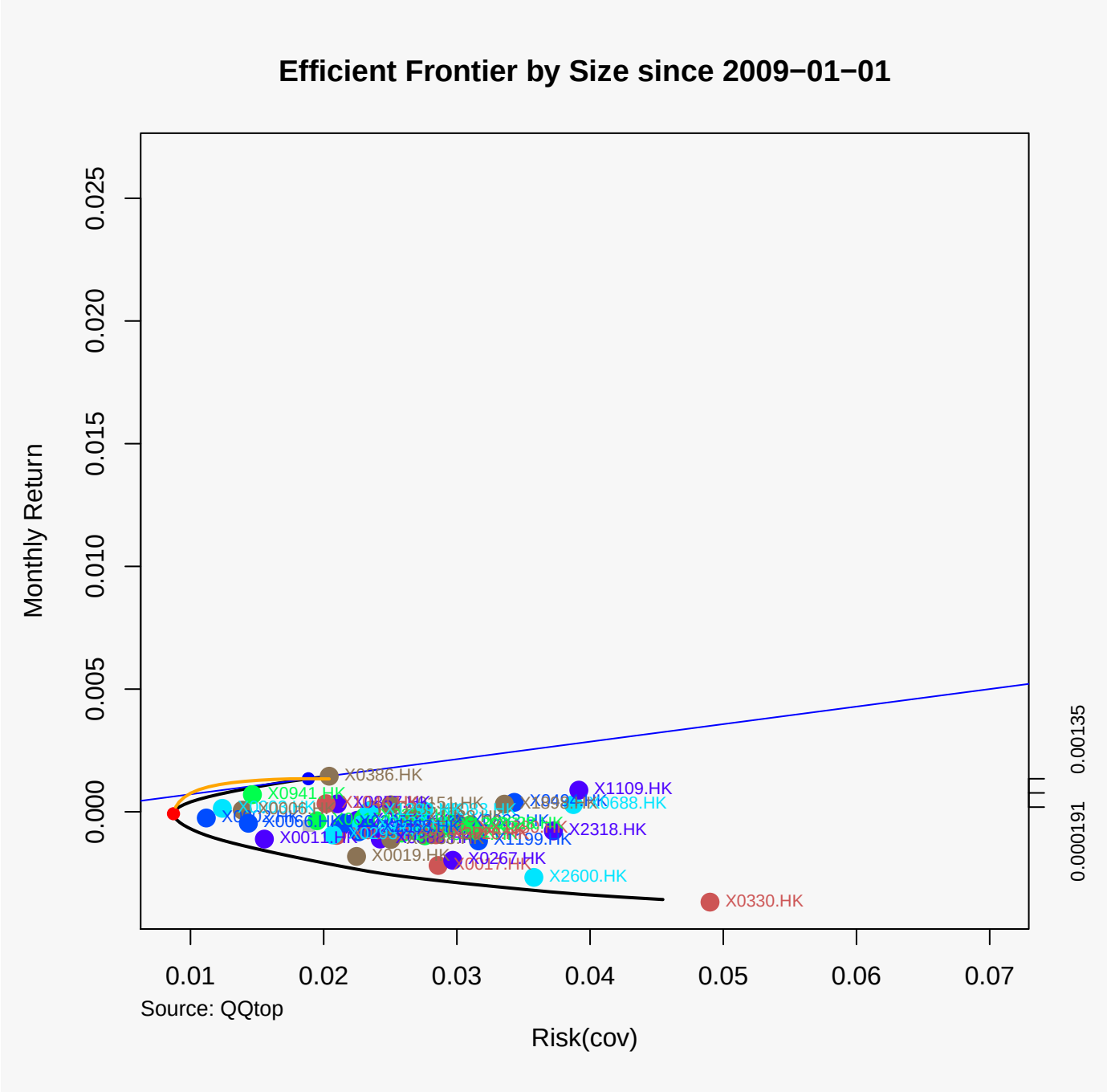
6.1 Performance Chart



6.2 Performance SnailTrail Chart



6.3 HSI Components Frontier




```
##
## Title:
##  MV Portfolio Frontier
##  Estimator:         covEstimator
##  Solver:            solveRquadprog
##  Optimize:          minRisk
##  Constraints:       LongOnly
##  Portfolio Points:  5 of 49
##
## Portfolio Weights:
##    X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK
```

```
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0578   0.0000
## 25   0.0000   0.3063   0.0000   0.0000   0.0000   0.1359   0.2338   0.0000
## 37   0.0000   0.1194   0.2459   0.0000   0.0000   0.2452   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.1836   0.4457   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0482   0.2073   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK X0322.HK X0330.HK X0386.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.8963   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.2053   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0686   0.0000
## 37   0.0000   0.0115   0.0000   0.0000   0.0000   0.0449   0.0000   0.0320
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   1.0000
##    X0388.HK X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK X0857.HK X0883.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0710   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0939.HK X0941.HK X1044.HK X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.1377   0.0923   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK X2628.HK X3328.HK X3988.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.1037   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.1075   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##
## Covariance Risk Budgets:
##    X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0265   0.0000
## 25   0.0000   0.1805   0.0000   0.0000   0.0000   0.0580   0.2396   0.0000
## 37   0.0000   0.1012   0.2415   0.0000   0.0000   0.2346   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.1727   0.3455   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0756   0.2867   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK X0322.HK X0330.HK X0386.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.9632   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.3308   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.1596   0.0000
## 37   0.0000   0.0118   0.0000   0.0000   0.0000   0.0388   0.0000   0.0458
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   1.0000
##    X0388.HK X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK X0857.HK X0883.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0681   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0939.HK X0941.HK X1044.HK X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.1615   0.0966   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK X2628.HK X3328.HK X3988.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0368   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.1245   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##
## Target Return and Risks:
##       mean      mu     Cov   Sigma    CVaR     VaR
## 1  -0.0036 -0.0036  0.0455  0.0455  0.1189  0.0743
## 13 -0.0023 -0.0023  0.0223  0.0223  0.0559  0.0434
## 25 -0.0011 -0.0011  0.0118  0.0118  0.0275  0.0232
## 37  0.0002  0.0002  0.0091  0.0091  0.0203  0.0140
## 49  0.0015  0.0015  0.0204  0.0204  0.0421  0.0267
##
## Description:
##  Mon Feb  6 23:35:40 2012 by user:
```

7 HSI Components Ratios

7.1 Sharpe Ratio - Combined

```
##                                           daily.returns
## Annualized StdDev Sharpe (Rf=0%, p=95%):       -0.6556
## Annualized VaR Sharpe (Rf=0%, p=95%):          -6.6626
## Annualized ES Sharpe (Rf=0%, p=95%):           -5.1937
```

7.2 Sharpe - Distinct

```
##                                          X0001.HK X0002.HK X0003.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3342   0.4654   0.6256
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.5615   4.6860   5.9833
## Annualized ES Sharpe (Rf=0%, p=95%):       2.7696   3.2993   2.5740
##                                          X0004.HK X0005.HK X0006.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.6598  -0.1160   0.5185
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.2103  -1.2086   5.3193
## Annualized ES Sharpe (Rf=0%, p=95%):       5.6576  -0.5843   3.7985
##                                          X0011.HK X0012.HK X0013.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0515    0.357   0.7026
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.5920    3.948   7.7051
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.5616    3.141   5.9511
##                                          X0016.HK X0017.HK X0019.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    0.534   0.0426   0.4432
## Annualized VaR Sharpe (Rf=0%, p=95%):       5.703   0.4482   4.4030
## Annualized ES Sharpe (Rf=0%, p=95%):        4.448   0.3133   2.6176
##                                          X0023.HK X0066.HK X0083.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.6138   0.5626   0.3587
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.5895   6.5806   3.7905
## Annualized ES Sharpe (Rf=0%, p=95%):       7.3806   5.6039   2.7644
##                                          X0101.HK X0144.HK X0151.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3271   0.4498   0.8739
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.5778   4.8301   9.3388
## Annualized ES Sharpe (Rf=0%, p=95%):       2.8405   3.8298   7.0774
##                                          X0267.HK X0291.HK X0293.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3144   0.6721   0.5516
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.6459   7.2751   5.7729
## Annualized ES Sharpe (Rf=0%, p=95%):       3.1014   5.8203   4.3089
##                                          X0322.HK X0330.HK X0386.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    1.016  -0.6543    0.728
## Annualized VaR Sharpe (Rf=0%, p=95%):      13.868  -6.0317    7.503
## Annualized ES Sharpe (Rf=0%, p=95%):       13.868  -3.2141    5.626
##                                          X0388.HK X0494.HK X0688.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.5872  -0.0889   0.2201
## Annualized VaR Sharpe (Rf=0%, p=95%):      6.6518  -0.8958   2.5559
## Annualized ES Sharpe (Rf=0%, p=95%):       5.4153  -0.7317   2.1995
##                                          X0700.HK X0762.HK X0836.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    1.312   0.3806  -0.0256
## Annualized VaR Sharpe (Rf=0%, p=95%):      13.873   4.2248  -0.2626
## Annualized ES Sharpe (Rf=0%, p=95%):       10.290   3.3670  -0.2087
##                                          X0857.HK X0883.HK X0939.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    0.493   0.7383   0.3649
## Annualized VaR Sharpe (Rf=0%, p=95%):       4.961   7.7397   3.6189
## Annualized ES Sharpe (Rf=0%, p=95%):        3.756   5.7977   2.5075
##                                          X0941.HK X1044.HK X1088.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0359    1.151   0.6515
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.3784   12.734   6.5949
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.2912    9.893   5.0583
##                                          X1109.HK X1199.HK X1299.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2451    0.250   0.3405
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.8833    2.752   3.5117
## Annualized ES Sharpe (Rf=0%, p=95%):       2.4912    2.207   2.2040
##                                          X1398.HK X1880.HK X1898.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2432    1.228   0.3155
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.7356   13.975   3.0883
```

```
## Annualized ES Sharpe (Rf=0%, p=95%):       2.2245   11.022   2.0930
##                                          X2318.HK X2388.HK X2600.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.4048   0.9074  -0.0971
## Annualized VaR Sharpe (Rf=0%, p=95%):      4.2915  10.3963  -1.0319
## Annualized ES Sharpe (Rf=0%, p=95%):       3.0709   8.4144  -0.8174
##                                          X2628.HK X3328.HK X3988.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0609   0.0757   0.4668
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.6064   0.7663   4.9061
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.4247   0.5655   3.5493
```

7.3 Information Ratio - Combined

```
## [1] "Information Ratio :  -0.4816"
```

7.4 Information Ratio - Distinct

```
##                         X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK
## Information Ratio: HSI  -0.0985  -0.2456   0.0715   0.4927  -0.6599
##                         X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK
## Information Ratio: HSI  -0.1185  -0.6771   0.0017   0.4797   0.2436
##                         X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK
## Information Ratio: HSI  -0.3678   0.0739    0.357   0.0079   0.0842
##                         X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK
## Information Ratio: HSI   0.0329    0.253   0.5058   0.0369   0.4208
##                         X0293.HK X0322.HK X0330.HK X0386.HK X0388.HK
## Information Ratio: HSI   0.2299   0.5921    -1.01   0.5218   0.4234
##                         X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK
## Information Ratio: HSI   0.3149  -0.0844    1.256   0.0381   -0.408
##                         X0857.HK X0883.HK X0939.HK X0941.HK X1044.HK
## Information Ratio: HSI   0.2203   0.7194  -0.0327  -0.7027   0.7816
##                         X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## Information Ratio: HSI    0.541  -0.0079  -0.0083   0.7892  -0.2001
##                         X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK
## Information Ratio: HSI    1.072   0.0794   0.1805   0.7157  -0.5115
##                         X2628.HK X3328.HK X3988.HK
## Information Ratio: HSI  -0.6866  -0.5037   0.1531
```

8 HSI Components Table Latest Quotes

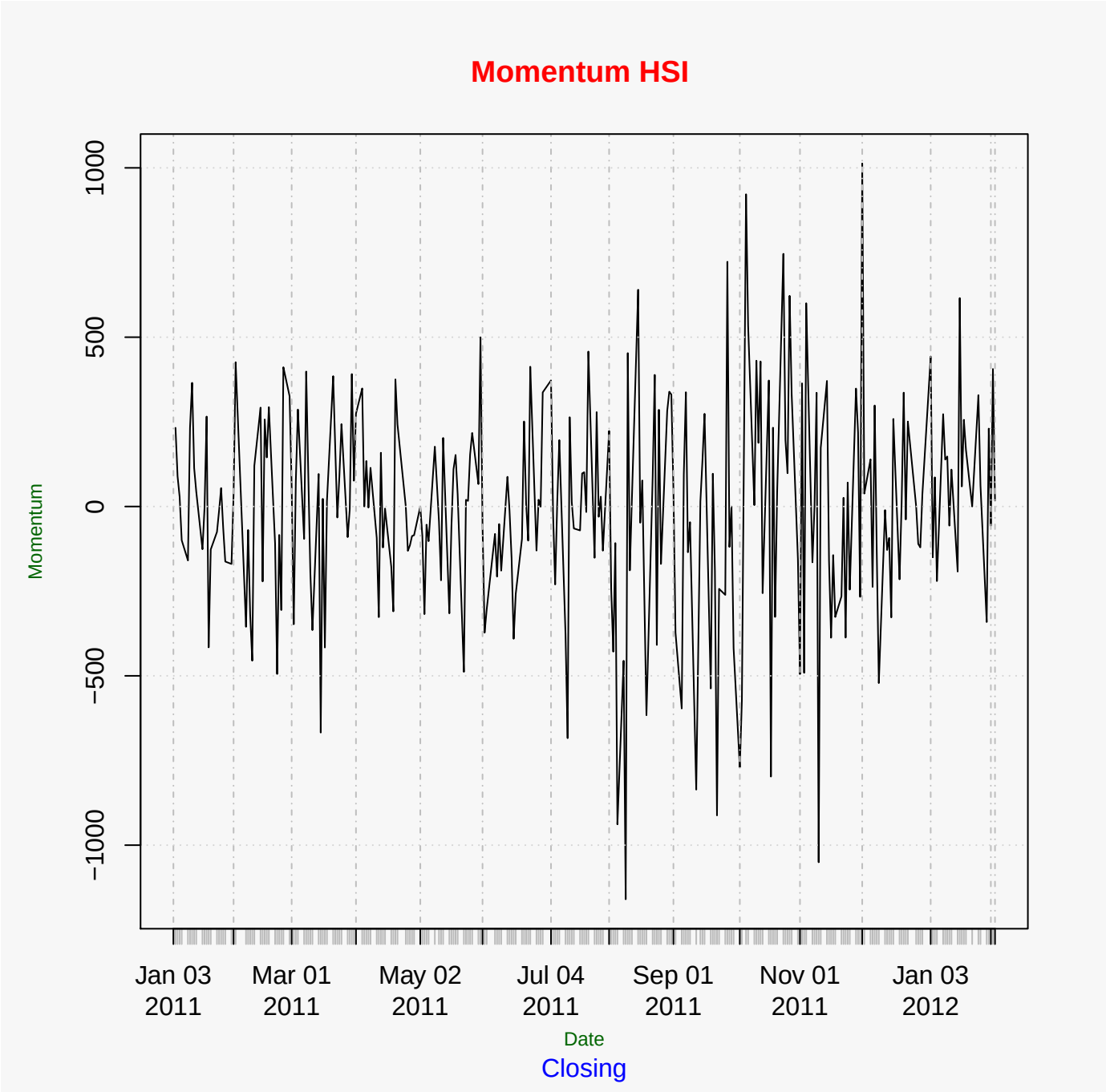
```
## [1] "Date :  2012-02-06 02:59:00"

##                    Name    Bid    Ask Change   52-week Range
## 0001.HK     CHEUNG KONG 104.00 104.30  -0.80  79.10 - 137.60
## 0002.HK    CLP HOLDINGS  63.00  63.10  -0.10   59.85 - 75.20
## 0003.HK  HK & CHINA GAS  18.20  18.22  -0.02   16.70 - 19.68
## 0004.HK  WHARF HOLDINGS  45.90  46.15   0.45   33.15 - 63.80
## 0005.HK   HSBC HOLDINGS  67.90  68.00   1.05   56.35 - 91.90
## 0006.HK    POWER ASSETS  56.05  56.10   0.20   48.10 - 64.80
## 0011.HK  HANG SENG BANK 100.40 100.50  -0.20  84.40 - 134.40
## 0012.HK  HENDERSON LAND  43.30  43.50  -0.10   33.20 - 61.50
## 0013.HK       HUTCHISON  76.35  76.40  -0.10   53.60 - 97.45
## 0016.HK         SHK PPT 108.20 108.60  -1.40  85.45 - 147.00
## 0017.HK   NEW WORLD DEV   8.77   8.79   0.12    7.00 - 17.98
## 0019.HK SWIRE PACIFIC A  84.00  84.15  -0.20  79.30 - 137.20
## 0023.HK  BANK OF E ASIA  30.55  30.60  -0.05   21.85 - 36.60
## 0066.HK MTR CORPORATION  26.05  26.10  -0.05   22.45 - 31.55
## 0083.HK       SINO LAND  12.64  12.68  -0.14    9.33 - 18.90
## 0101.HK   HANG LUNG PPT  27.55  27.80   0.75   20.85 - 40.50
## 0144.HK  CHINA MER HOLD  28.75  28.90   1.45   19.00 - 37.60
## 0151.HK WANT WANT CHINA   7.16   7.17  -0.13     5.68 - 8.30
## 0267.HK   CITIC PACIFIC  15.18  15.22   0.06   10.26 - 24.60
## 0291.HK CHINA RESOURCES  28.00  28.10   0.25   24.10 - 35.50
## 0293.HK  CATHAY PAC AIR  15.66  15.70   0.36   11.80 - 24.10
## 0322.HK          TINGYI  21.85  21.95  -0.20   17.32 - 26.00
## 0330.HK ESPRIT HOLDINGS  13.04  13.08   0.62    7.55 - 45.65
## 0386.HK    SINOPEC CORP   9.33   9.34  -0.28     6.22 - 8.90
## 0388.HK            HKEX 137.30 137.80   0.70  99.15 - 198.60
## 0494.HK       LI & FUNG  17.48  17.54   0.12   10.82 - 51.95
## 0688.HK  CHINA OVERSEAS  14.58  14.60  -0.34    9.99 - 17.86
## 0700.HK         TENCENT 185.80 185.90  -0.10 139.90 - 230.80
## 0762.HK    CHINA UNICOM  13.64  13.66  -0.64   10.24 - 17.68
## 0836.HK CHINA RES POWER  14.98  15.00   0.28   10.82 - 16.44
## 0857.HK      PETROCHINA  11.50  11.52   0.02    8.59 - 12.50
## 0883.HK           CNOOC  16.58  16.60  -0.18   11.20 - 21.30
## 0939.HK             CCB   6.37   6.38  -0.01     4.41 - 8.47
## 0941.HK    CHINA MOBILE  77.55  77.60  -1.35   68.05 - 83.80
## 1044.HK    HENGAN INT'L  68.30  68.55  -2.25   54.10 - 75.40
## 1088.HK   CHINA SHENHUA  35.30  35.40   0.70   27.10 - 40.20
## 1109.HK  CHINA RES LAND  13.52  13.56  -0.56    7.28 - 17.24
## 1199.HK   COSCO PACIFIC  12.00  12.02   0.54    7.52 - 17.16
## 1299.HK             AIA  25.80  25.85  -0.35   19.84 - 29.90
## 1398.HK            ICBC   5.46   5.47  -0.07     3.46 - 6.90
## 1880.HK     BELLE INT'L  13.14  13.16  -0.42   11.56 - 17.54
## 1898.HK      CHINA COAL  10.14  10.16   0.10    6.59 - 15.08
## 2318.HK         PING AN  63.65  63.75  -1.40   37.35 - 96.25
## 2388.HK   BOC HONG KONG  20.60  20.75   0.10   14.24 - 29.40
## 2600.HK          CHALCO   3.91   3.92   0.02     3.20 - 8.30
## 2628.HK      CHINA LIFE  23.25  23.30   0.05   17.04 - 36.90
## 3328.HK        BANKCOMM   6.44   6.45   0.03     4.15 - 9.53
## 3988.HK   BANK OF CHINA   3.39   3.40   0.00     2.20 - 5.02
```

9 Hang Seng Index

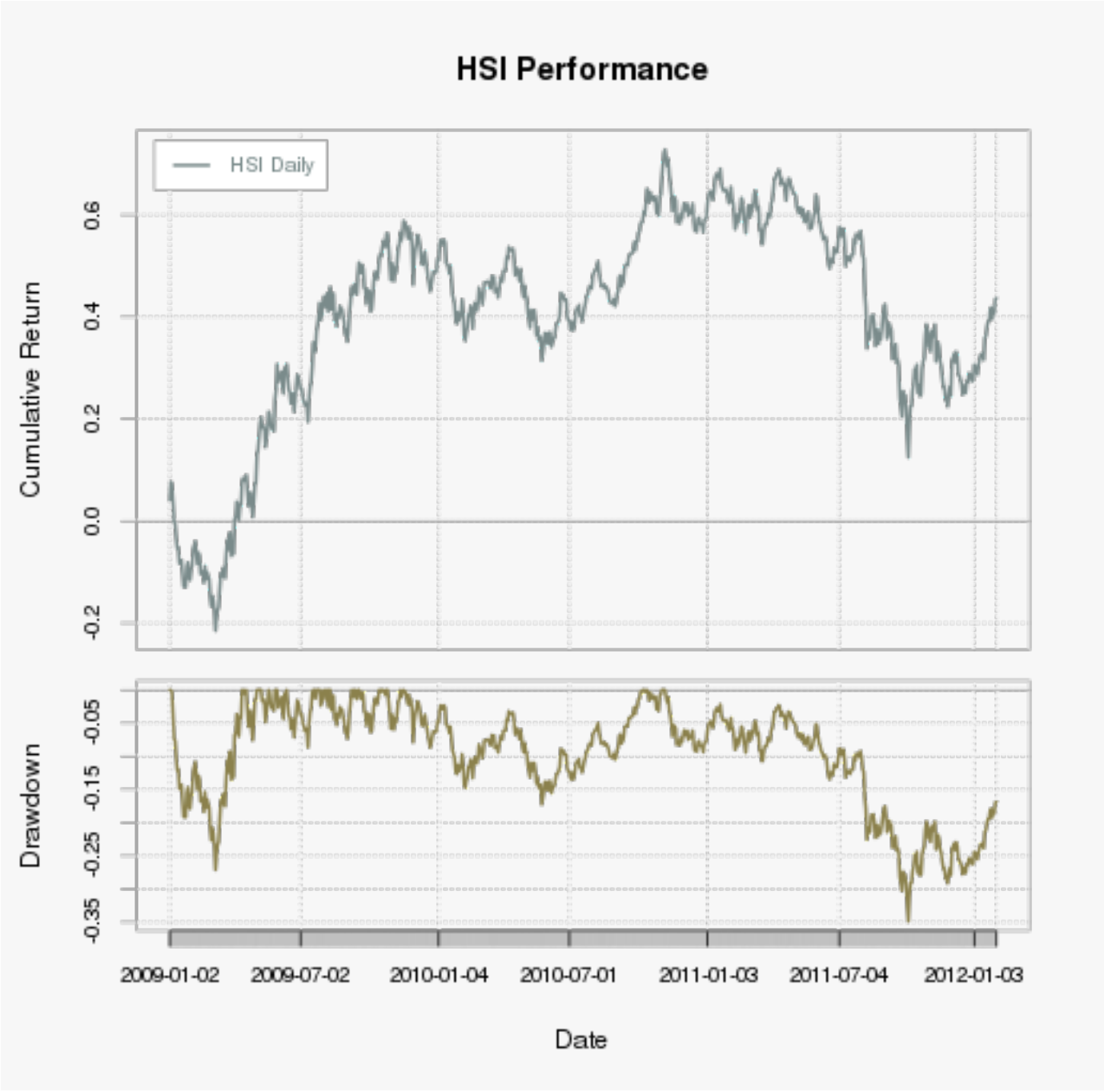
Latest Hang Seng Index

	Trade Time	Name	Last	Change	Days Range	52−week Range
^HSI	2012−02−06 03:01:00	HANG SENG INDEX	20710	−47.04	20633.131 − 21015.551	16170.30 − 24468.60

9.1 Hang Seng Index - Momentum



9.2 HSI Performance



9.3 HSI Ratios

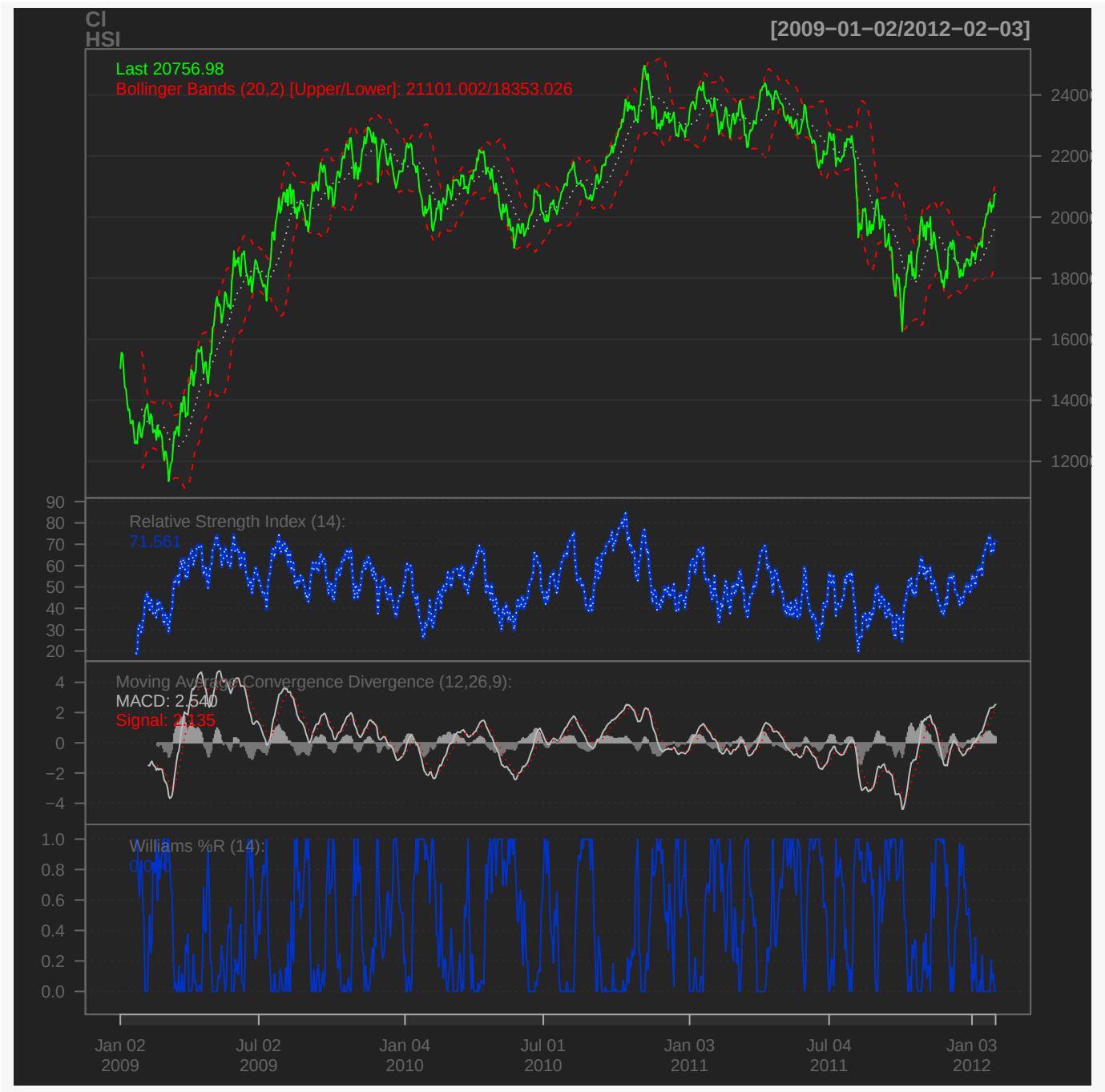
```
##               RSI
## 2012-01-19 68.43
## 2012-01-20 70.29
## 2012-01-23 70.29
## 2012-01-26 73.80
## 2012-01-27 74.42
## 2012-01-30 65.34
## 2012-01-31 68.16
## 2012-02-01 66.71
## 2012-02-02 71.38
## 2012-02-03 71.56
```

```
##              macd signal
## 2012-01-19 1.447 0.7954
## 2012-01-20 1.698 0.9759
## 2012-01-23 1.873 1.1554
## 2012-01-26 2.121 1.3484
## 2012-01-27 2.312 1.5412
## 2012-01-30 2.296 1.6922
## 2012-01-31 2.349 1.8235
## 2012-02-01 2.339 1.9265
## 2012-02-02 2.465 2.0342
## 2012-02-03 2.540 2.1355
```

```
## [1] "BBands"
```

```
##                dn  mavg    up   pctB
## 2012-01-19 18022 18900 19778 1.0937
## 2012-01-20 17991 18985 19979 1.0660
## 2012-01-23 18005 19072 20138 0.9869
## 2012-01-26 17962 19162 20362 1.0321
## 2012-01-27 17949 19256 20562 0.9768
## 2012-01-30 18021 19338 20655 0.8122
## 2012-01-31 18118 19437 20757 0.8612
## 2012-02-01 18243 19532 20822 0.8105
## 2012-02-02 18271 19626 20980 0.9112
## 2012-02-03 18353 19727 21101 0.8748
```

```
##             WPR %
## 2012-01-19  0.00
## 2012-01-20  0.00
## 2012-01-23  0.00
## 2012-01-26  0.00
## 2012-01-27  0.00
## 2012-01-30 20.86
## 2012-01-31  7.42
## 2012-02-01 11.30
## 2012-02-02  0.00
## 2012-02-03  0.00
```


CI
HSI
[2009−01−02/2012−02−03]
Last 20756.98
Bollinger Bands (20,2) [Upper/Lower]: 21101.002/18353.026
Relative Strength Index (14):
71.561
Moving Average Convergence Divergence (12,26,9):
MACD: 2.540
Signal: 2.135
Williams %R (14):
Jan 02 2009
Jul 02 2009
Jan 04 2010
Jul 01 2010
Jan 03 2011
Jul 04 2011
Jan 03 2012

9.4 HSI Volatility

9.5 HSI Statistics

```
##                                           HSI-Daily HSI-Monthly
## Annualized StdDev Sharpe (Rf=0%, p=95%):    0.4815      0.4454
## Annualized VaR Sharpe (Rf=0%, p=95%):       4.9449      1.0787
## Annualized ES Sharpe (Rf=0%, p=95%):        3.6479      0.8466
```

```
##          HSI-Daily HSI-Monthly
## Skewness     0.115      0.1168
```

```
##          HSI-Daily HSI-Monthly
## Kurtosis     1.391    -0.04417
```

```
##       Index              HSI Daily
##  Min.   :2009-01-02   Min.   :-0.056605
##  1st Qu.:2009-10-10   1st Qu.:-0.008075
##  Median :2010-07-20   Median : 0.000304
##  Mean   :2010-07-19   Mean   : 0.000597
##  3rd Qu.:2011-04-25   3rd Qu.: 0.010223
##  Max.   :2012-02-03   Max.   : 0.074147
```

```
##       Index             HSI Monthly
##  Min.   :2009-01-30   Min.   :-0.14329
##  1st Qu.:2009-11-06   1st Qu.:-0.01913
##  Median :2010-08-15   Median : 0.00817
##  Mean   :2010-08-14   Mean   : 0.01083
##  3rd Qu.:2011-05-23   3rd Qu.: 0.03680
##  Max.   :2012-02-03   Max.   : 0.17074
```

10 Dataset First and Last Rows Info

```
##            X0001.HK.Close
## 2009-01-02           76.9
## 2012-02-03          104.9
##            X0002.HK.Close
## 2009-01-02          52.40
## 2012-02-03          63.15
##            X0003.HK.Close
## 2009-01-02          12.08
## 2012-02-03          18.26
##            X0004.HK.Close
## 2009-01-02          22.00
## 2012-02-03          45.65
##            X0005.HK.Close
## 2009-01-02           77.0
## 2012-02-03           66.9
##            X0006.HK.Close
## 2009-01-02          42.75
## 2012-02-03          55.90
##            X0011.HK.Close
## 2009-01-02          104.7
## 2012-02-03          100.7
##            X0012.HK.Close
## 2009-01-02          30.35
## 2012-02-03          43.65
##            X0013.HK.Close
## 2009-01-02          39.85
## 2012-02-03          76.45
##            X0016.HK.Close
## 2009-01-02           67.3
## 2012-02-03          109.6
##            X0017.HK.Close
## 2009-01-02           8.18
## 2012-02-03           8.63
##            X0019.HK.Close
## 2009-01-02          55.75
## 2012-02-03          84.40
##            X0023.HK.Close
## 2009-01-02          16.68
## 2012-02-03          30.60
##            X0066.HK.Close
## 2009-01-02          18.08
## 2012-02-03          26.10
##            X0083.HK.Close
## 2009-01-02           8.36
## 2012-02-03          12.84
##            X0101.HK.Close
## 2009-01-02          18.36
## 2012-02-03          27.10
##            X0144.HK.Close
## 2009-01-02           15.4
## 2012-02-03           27.4
##            X0151.HK.Close
## 2009-01-02           3.17
## 2012-02-03           7.30
##            X0267.HK.Close
```

```
## 2009-01-02          10.20
## 2012-02-03          15.16
##            X0291.HK.Close
## 2009-01-02           14.0
## 2012-02-03           27.8
##            X0293.HK.Close
## 2009-01-02           8.91
## 2012-02-03          15.32
##            X0322.HK.Close
## 2009-01-02           8.98
## 2012-02-03          22.10
##            X0330.HK.Close
## 2009-01-02           44.8
## 2012-02-03           12.4
##            X0386.HK.Close
## 2009-01-02           4.96
## 2012-02-03           9.59
##            X0388.HK.Close
## 2009-01-02           76.6
## 2012-02-03          137.0
##            X0494.HK.Close
## 2011-06-02          17.92
## 2012-02-03          17.34
##            X0688.HK.Close
## 2009-01-02          11.22
## 2012-02-03          14.94
##            X0700.HK.Close
## 2009-01-01             50
## 2012-02-03            186
##            X0762.HK.Close
## 2009-01-01           9.63
## 2012-02-03          14.30
##            X0836.HK.Close
## 2009-01-02          15.12
## 2012-02-03          14.72
##            X0857.HK.Close
## 2009-01-02           7.20
## 2012-02-03          11.48
##            X0883.HK.Close
## 2009-01-02           7.59
## 2012-02-03          16.76
##            X0939.HK.Close
## 2009-01-02           4.52
## 2012-02-03           6.39
##            X0941.HK.Close
## 2009-01-02          81.20
## 2012-02-03          78.95
##            X1044.HK.Close
## 2009-01-01           24.9
## 2012-02-03           70.3
##            X1088.HK.Close
## 2009-01-02           17.4
## 2012-02-03           34.8
##            X1109.HK.Close
## 2009-01-02            9.9
## 2012-02-03           14.1
##            X1199.HK.Close
```

```
## 2009-01-02           8.07
## 2012-02-03          11.50
##            X1299.HK.Close
## 2010-10-29           23.1
## 2012-02-03           26.2
##            X1398.HK.Close
## 2009-01-02           4.30
## 2012-02-03           5.53
##            X1880.HK.Close
## 2009-01-02           3.50
## 2012-02-03          13.52
##            X1898.HK.Close
## 2009-01-02           6.55
## 2012-02-03          10.04
##            X2318.HK.Close
## 2009-01-02           39.6
## 2012-02-03           65.1
##            X2388.HK.Close
## 2009-01-02           9.06
## 2012-02-03          20.65
##            X2600.HK.Close
## 2009-01-02           4.55
## 2012-02-03           3.90
##            X2628.HK.Close
## 2009-01-02          24.75
## 2012-02-03          23.15
##            X3328.HK.Close
## 2009-01-02           5.91
## 2012-02-03           6.42
##            X3988.HK.Close
## 2009-01-02           2.17
## 2012-02-03           3.39
```

11 Notes

This paper was generated using R and following R libraries :
qmao XML quantmod PerformanceAnalytics
fPortfolio fBasic grid gridExtra knitr

Market Data Source : yahoo.finance

Currently this paper is automatically generated with a daily cron job.
Generating this document takes about 200 secs. on an i7 CPU
No representations are made concerning correctness , usefullness etc. Use at your own risk !
Improvements and changes without further notice.

This is the End !