CAPM and other Statistics for HSI Components Version 1.1

QQtop*
Department of R Dabbling
QQtop Laboratory Hong Kong
noemail.address@gmail.com

Internet OpenSource Community†
Worldwide
No mail. We just code !

February 10, 2012

Contents

*No funding received yet. Please donate urgently
†Itself

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                                0.0003
## Beta                                 1.1862
## Beta+                                1.2690
## Beta-                                1.1520
## R-squared                            0.5551
## Annualized Alpha                     0.0865
## Correlation                          0.7451
## Correlation p-value                  0.0000
## Tracking Error                       0.2646
## Active Premium                       0.0223
## Information Ratio                    0.0843
## Treynor Ratio                       -0.0612
```

[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   0.000   0.000
## Beta                  0.989   0.147   0.378   1.112   1.121   0.114
## Beta+                 0.955   0.043   0.276   1.113   1.212   0.060
## Beta-                 0.969   0.188   0.410   1.088   1.311   0.126
## R-squared             0.639   0.079   0.179   0.494   0.560   0.028
## Annualized Alpha      0.000   0.051   0.108   0.167  -0.124   0.088
## Correlation           0.799   0.281   0.423   0.703   0.748   0.167
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.193   0.257   0.265   0.294   0.260   0.289
## Active Premium       -0.022  -0.065   0.014   0.147  -0.164  -0.040
## Information Ratio    -0.116  -0.254   0.053   0.500  -0.632  -0.137
## Treynor Ratio         0.109   0.444   0.382   0.249  -0.030   0.795
##                     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   1.136   0.785
## Beta+                 0.703   1.049   0.864   0.968   1.059   0.852
## Beta-                 0.673   0.992   0.987   0.979   1.164   0.722
## R-squared             0.452   0.556   0.527   0.642   0.503   0.384
## Annualized Alpha     -0.075   0.020   0.132   0.059  -0.050   0.077
## Correlation           0.673   0.746   0.726   0.801   0.709   0.620
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.205   0.236   0.234   0.195   0.296   0.264
## Active Premium       -0.139  -0.007   0.109   0.044  -0.090   0.022
## Information Ratio    -0.676  -0.028   0.468   0.228  -0.304   0.084
## Treynor Ratio        -0.013   0.122   0.253   0.174   0.036   0.194
##                     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   1.166   1.092   1.310   0.431
## Beta+                 1.019   0.430   1.135   1.246   1.257   0.204
## Beta-                 0.927   0.503   1.206   0.990   1.220   0.513
## R-squared             0.462   0.338   0.515   0.464   0.537   0.096
## Annualized Alpha      0.125   0.074   0.049   0.054   0.113   0.305
## Correlation           0.680   0.581   0.718   0.681   0.733   0.311
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.264   0.225   0.297   0.306   0.326   0.374
## Active Premium        0.092   0.003   0.022   0.017   0.097   0.178
## Information Ratio     0.348   0.013   0.073   0.056   0.297   0.477
## Treynor Ratio         0.236   0.262   0.130   0.135   0.174   0.716
##                     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                  1.081   0.878   0.766   0.348   0.937   0.955
## Beta+                 1.032   0.777   0.732   0.264   0.736   0.808
## Beta-                 0.984   0.906   0.755   0.386   1.141   0.992
## R-squared             0.403   0.369   0.318   0.071   0.213   0.557
## Annualized Alpha      0.075   0.170   0.141   0.354  -0.314   0.119
## Correlation           0.635   0.607   0.564   0.267   0.462   0.746
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.342   0.300   0.298   0.368   0.468   0.222
## Active Premium        0.025   0.121   0.078   0.220  -0.441   0.099
## Information Ratio     0.073   0.402   0.263   0.599  -0.941   0.448
## Treynor Ratio         0.144   0.286   0.272   1.008  -0.331   0.241
##                     0388.HK 0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
## Alpha                 0.000   0.000   0.000   0.002   0.000   0.000
## Beta                  1.159   0.971   1.187   0.932   0.707   0.556
```

```
## Beta+                 1.246   0.950   1.347   0.970   0.546   0.428
## Beta-                 1.111   0.869   0.933   0.778   0.653   0.665
## R-squared             0.704   0.204   0.472   0.353   0.254   0.178
## Annualized Alpha      0.095   0.132   0.021   0.451   0.091  -0.026
## Correlation           0.839   0.452   0.687   0.594   0.504   0.421
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.200   0.501   0.330   0.328   0.323   0.332
## Active Premium        0.101  -0.032  -0.018   0.415   0.010  -0.128
## Information Ratio     0.506  -0.063  -0.054   1.266   0.032  -0.387
## Treynor Ratio         0.200   0.093   0.095   0.578   0.197   0.004
##                     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                  1.101   1.282   1.062   0.710   0.462   1.214
## Beta+                 1.019   1.195   1.004   0.704   0.365   1.139
## Beta-                 1.101   1.253   1.033   0.732   0.406   1.149
## R-squared             0.725   0.685   0.700   0.519   0.118   0.646
## Annualized Alpha      0.047   0.164   0.000  -0.087   0.384   0.121
## Correlation           0.852   0.827   0.837   0.720   0.344   0.804
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.178   0.238   0.181   0.193   0.356   0.240
## Active Premium        0.044   0.182  -0.013  -0.143   0.270   0.124
## Information Ratio     0.250   0.764  -0.070  -0.741   0.759   0.518
## Treynor Ratio         0.159   0.243   0.111  -0.018   0.854   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                  1.165   1.330   0.824   1.129   0.828   1.497
## Beta+                 1.227   1.338   0.816   1.099   0.783   1.406
## Beta-                 0.792   1.454   1.049   1.052   0.888   1.444
## R-squared             0.361   0.489   0.412   0.686   0.223   0.664
## Annualized Alpha      0.076   0.055   0.212  -0.035   0.501   0.032
## Correlation           0.601   0.699   0.642   0.828   0.473   0.815
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.405   0.364   0.243   0.201   0.404   0.306
## Active Premium        0.009   0.021   0.185  -0.048   0.411   0.033
## Information Ratio     0.022   0.057   0.760  -0.241   1.019   0.108
## Treynor Ratio         0.119   0.114   0.132   0.073   0.654   0.109
##                     2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## Alpha                 0.000   0.001   0.000   0.000   0.000   0.000
## Beta                  1.330   0.878   1.541   1.097   1.194   1.033
## Beta+                 1.377   0.888   1.588   1.069   1.159   0.956
## Beta-                 1.223   0.851   1.408   1.059   1.211   1.008
## R-squared             0.622   0.443   0.618   0.638   0.728   0.631
## Annualized Alpha      0.051   0.230  -0.122  -0.125  -0.094   0.039
## Correlation           0.789   0.666   0.786   0.799   0.853   0.795
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.283   0.258   0.345   0.216   0.197   0.205
## Active Premium        0.046   0.200  -0.149  -0.156  -0.109   0.024
## Information Ratio     0.162   0.778  -0.431  -0.720  -0.553   0.114
## Treynor Ratio         0.132   0.377  -0.012  -0.023   0.018   0.149
```

3 HSI Components Risk

3.1 Correlation

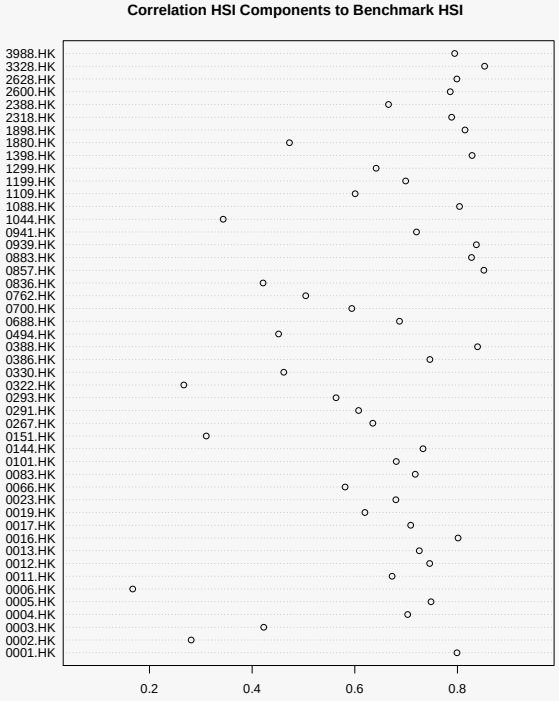
Correlation Combined

```
##                       Correlation p-value Lower CI Upper CI
## HSI Components to HSI      0.7451       0   0.6717    0.804
```

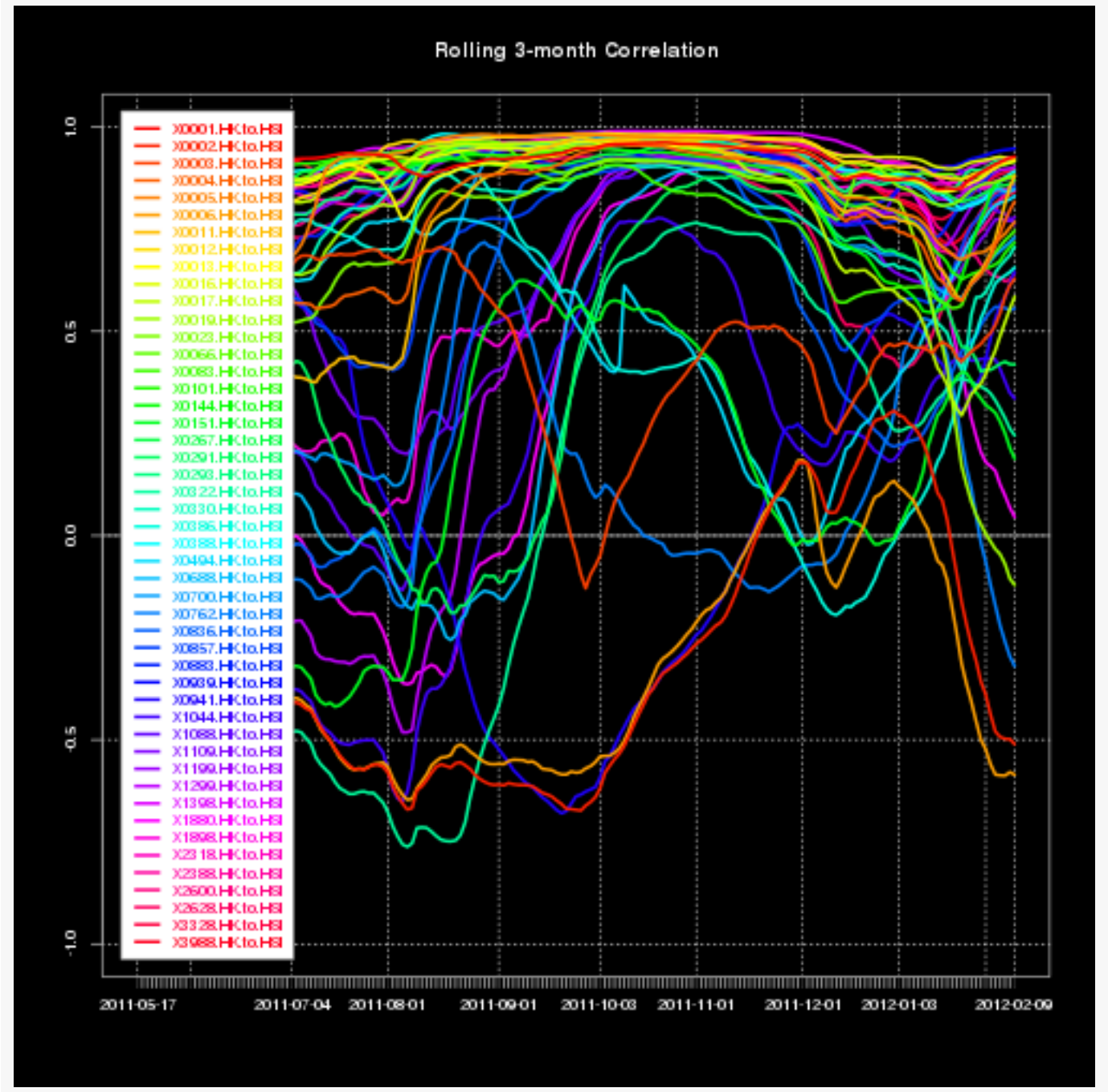
Correlation - Distinct

```
##         Correlation p-value Lower CI Upper CI
## 0001.HK      0.7991       0   0.7629   0.8303
## 0002.HK      0.2812       0   0.1935   0.3645
## 0003.HK      0.4226       0   0.3433   0.4959
## 0004.HK      0.7030       0   0.6528   0.7470
## 0005.HK      0.7485       0   0.7046   0.7866
## 0006.HK      0.1673       0   0.0757   0.2560
## 0011.HK      0.6727       0   0.6185   0.7205
## 0012.HK      0.7459       0   0.7016   0.7843
## 0013.HK      0.7257       0   0.6786   0.7668
## 0016.HK      0.8012       0   0.7654   0.8321
## 0017.HK      0.7089       0   0.6596   0.7522
## 0019.HK      0.6197       0   0.5590   0.6737
## 0023.HK      0.6800       0   0.6268   0.7269
## 0066.HK      0.5811       0   0.5162   0.6394
## 0083.HK      0.7178       0   0.6696   0.7599
## 0101.HK      0.6808       0   0.6277   0.7276
## 0144.HK      0.7329       0   0.6868   0.7731
## 0151.HK      0.3106       0   0.2243   0.3920
## 0267.HK      0.6351       0   0.5763   0.6874
## 0291.HK      0.6074       0   0.5454   0.6628
## 0293.HK      0.5635       0   0.4967   0.6236
## 0322.HK      0.2669       0   0.1786   0.3510
## 0330.HK      0.4616       0   0.3853   0.5316
## 0386.HK      0.7463       0   0.7021   0.7847
## 0388.HK      0.8392       0   0.8094   0.8646
## 0494.HK      0.4515       0   0.3739   0.5228
## 0688.HK      0.6871       0   0.6349   0.7332
## 0700.HK      0.5942       0   0.5308   0.6510
## 0762.HK      0.5044       0   0.4320   0.5704
## 0836.HK      0.4213       0   0.3419   0.4947
## 0857.HK      0.8515       0   0.8238   0.8751
## 0883.HK      0.8274       0   0.7958   0.8546
## 0939.HK      0.8369       0   0.8067   0.8627
## 0941.HK      0.7202       0   0.6724   0.7620
## 1044.HK      0.3436       0   0.2593   0.4227
## 1088.HK      0.8041       0   0.7686   0.8346
## 1109.HK      0.6007       0   0.5379   0.6568
## 1199.HK      0.6991       0   0.6484   0.7436
## 1299.HK      0.6416       0   0.5480   0.7193
## 1398.HK      0.8285       0   0.7970   0.8555
## 1880.HK      0.4727       0   0.3974   0.5417
## 1898.HK      0.8147       0   0.7810   0.8437
## 2318.HK      0.7887       0   0.7509   0.8214
## 2388.HK      0.6657       0   0.6106   0.7143
## 2600.HK      0.7860       0   0.7477   0.8190
## 2628.HK      0.7989       0   0.7627   0.8302
```

```
## 3328.HK      0.8529        0   0.8255   0.8764
## 3988.HK      0.7946        0   0.7577   0.8264
```



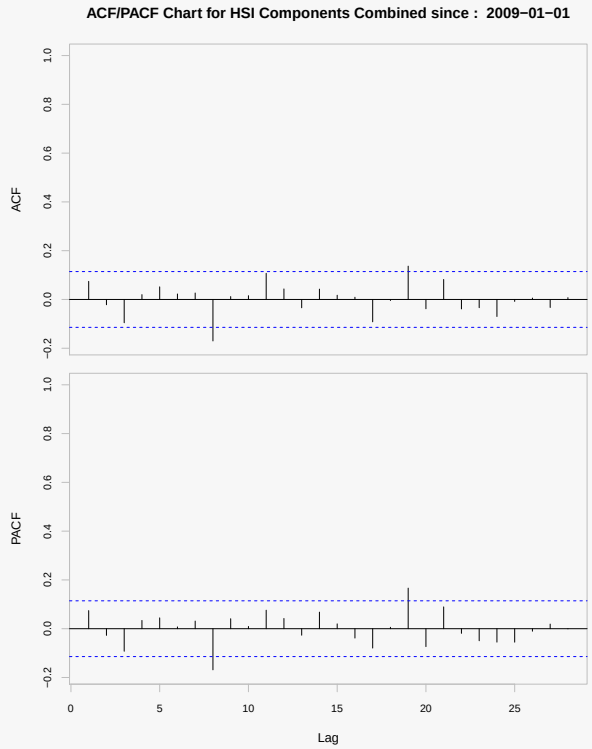
3 Month Rolling Correlation



3.2 Autocorrelation Coefficients - Combined

Autocorrelation Combined

```
##                  rho1    rho2    rho3 rho4   rho5   rho6 Q(6) p-value
## daily.returns 0.0743 -0.0217 -0.0955 0.02 0.0518 0.0225       0.4446
```



3.3 Downside Risk - Combined

Downside Risk Combined

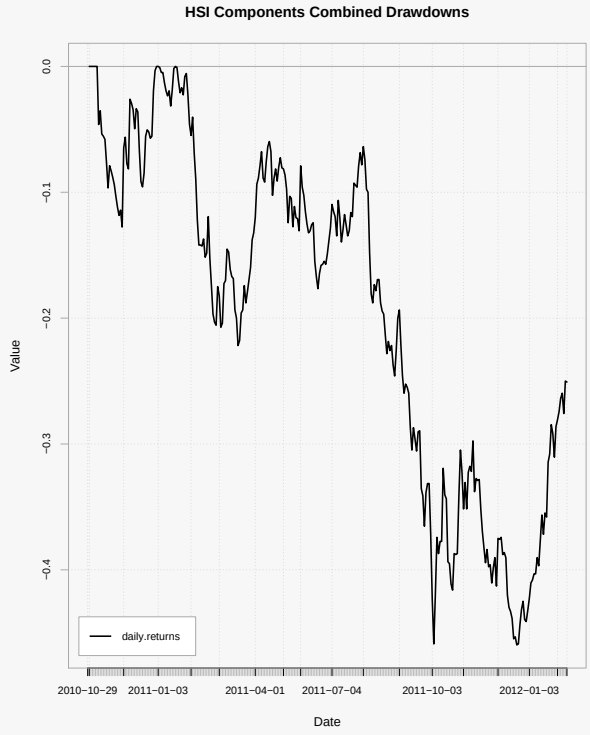
```
##                                HSI Components dailyReturn
## Semi Deviation                                      0.0224
## Gain Deviation                                      0.0182
## Loss Deviation                                      0.0153
## Downside Deviation (MAR=210%)                       0.0261
## Downside Deviation (Rf=0%)                          0.0228
## Downside Deviation (0%)                             0.0228
## Maximum Drawdown                                    0.4597
## Historical VaR (95%)                               -0.0364
## Historical ES (95%)                                -0.0511
## Modified VaR (95%)                                 -0.0372
## Modified ES (95%)                                  -0.0475
```

3.4 Drawdowns - Combined

Drawdowns Combined

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

```
##         From     Trough         To   Depth Length To Trough Recovery
## 1 2011-01-19 2011-12-19       <NA> -0.4597    251       218       NA
## 2 2010-11-09 2010-11-30 2010-12-31 -0.1276     38        16       22
## 3 2011-01-04 2011-01-13 2011-01-18 -0.0315     11         8        3
```



3.5 Downside Deviation - Combined

Downside Deviation Combined

```
##                                 HSI Components
## Downside Deviation (MAR = 0%)          0.02281
```

3.6 Autocorrelation Coefficients - Distinct

```
##             rho1    rho2    rho3    rho4    rho5    rho6 Q(6) p-value
## X0001.HK  0.0495 -0.0636  0.0195 -0.0340  0.0083  0.0138       0.3782
## X0002.HK -0.1258 -0.0470 -0.0099  0.0193  0.0159 -0.0298       0.0188
## X0003.HK -0.0994 -0.0157 -0.0207  0.0481  0.0148  0.0282       0.0968
## X0004.HK  0.0064 -0.0334 -0.0295 -0.0295  0.0899 -0.0356       0.1469
## X0005.HK -0.0238 -0.0234  0.0604  0.0344 -0.0484  0.0303       0.3082
## X0006.HK -0.0841 -0.0615  0.0140 -0.0234  0.0047 -0.0738       0.0396
## X0011.HK  0.1185  0.0152 -0.0160  0.0031 -0.0475 -0.0834       0.0053
## X0012.HK  0.0661 -0.0255 -0.0491 -0.0074  0.0467  0.0067       0.2756
## X0013.HK  0.0015  0.0314  0.0127 -0.0137  0.0253 -0.0259       0.9146
## X0016.HK  0.0470 -0.0581  0.0216 -0.0091  0.0407  0.0201       0.3860
## X0017.HK  0.0778  0.0217  0.0092  0.0256  0.0499 -0.0206       0.2472
## X0019.HK  0.0413  0.0465 -0.0257 -0.1051 -0.0064  0.0181       0.0542
## X0023.HK  0.0893 -0.0066 -0.0088 -0.0069 -0.0485 -0.0386       0.1580
## X0066.HK -0.0746 -0.0005  0.0550 -0.0217 -0.0095 -0.0165       0.2945
## X0083.HK  0.1006 -0.0594 -0.0383  0.0033  0.0469  0.0014       0.0368
## X0101.HK -0.0724 -0.0206  0.0151 -0.0418 -0.0586  0.0209       0.1780
## X0144.HK  0.0629 -0.0074 -0.0013 -0.0484 -0.1060  0.0037       0.0338
## X0151.HK -0.0188 -0.0268 -0.0855 -0.1026  0.0111 -0.0002       0.0222
## X0267.HK  0.1234  0.0379 -0.0544 -0.0215  0.0422  0.0437       0.0053
## X0291.HK -0.0355 -0.0201  0.0063 -0.0441  0.0107 -0.0033       0.8183
## X0293.HK  0.0252 -0.0456 -0.0681 -0.0537  0.0750  0.0708       0.0127
## X0322.HK -0.0115  0.0357 -0.0908 -0.0016 -0.0155 -0.0231       0.2326
## X0330.HK  0.0471  0.1265 -0.0098  0.0413 -0.0053 -0.0172       0.0152
## X0386.HK -0.0216 -0.0252 -0.0400 -0.0156 -0.0100  0.0333       0.7809
## X0388.HK  0.1003 -0.0108  0.0335 -0.0138  0.0051 -0.0121       0.1724
## X0494.HK -0.0109 -0.0304 -0.0127 -0.0238 -0.0111  0.0083       0.9593
## X0688.HK  0.0801 -0.0548 -0.0536 -0.0490 -0.0066  0.0099       0.0746
## X0700.HK  0.0226 -0.0973  0.0021 -0.0901  0.0036  0.0384       0.0176
## X0762.HK -0.0499 -0.0721 -0.0317 -0.0646  0.0318 -0.0301       0.0726
## X0836.HK -0.0525 -0.0387 -0.0025  0.0051 -0.0104 -0.0173       0.7268
## X0857.HK  0.0434 -0.0142  0.0384 -0.0028 -0.0070  0.0052       0.8315
## X0883.HK  0.0442 -0.0519 -0.0116 -0.0270 -0.0566  0.0018       0.3438
## X0939.HK  0.0014  0.0041  0.0198 -0.0567 -0.0312 -0.0323       0.6248
## X0941.HK -0.0163 -0.0184  0.0038 -0.0932  0.0051 -0.0250       0.2584
## X1044.HK -0.0330 -0.0473 -0.0980 -0.0589 -0.0408  0.0151       0.0254
## X1088.HK  0.0476 -0.0031 -0.0262 -0.0340  0.0281 -0.0362       0.5668
## X1109.HK  0.0302 -0.0207 -0.0567 -0.0908  0.0116  0.0004       0.1234
## X1199.HK  0.0738  0.0470 -0.0020 -0.0655  0.0077  0.0367       0.1112
## X1299.HK -0.0127 -0.0877  0.0159 -0.0777 -0.1091 -0.0052       0.2088
## X1398.HK  0.0189 -0.0017  0.0624 -0.0230 -0.0192 -0.0380       0.5281
## X1880.HK  0.0070 -0.0836 -0.0857 -0.0281 -0.0375 -0.0324       0.0338
## X1898.HK  0.0951  0.0166 -0.0003  0.0063 -0.0487 -0.0178       0.1565
## X2318.HK  0.0680 -0.0465 -0.0700 -0.0390  0.0710  0.0085       0.0274
## X2388.HK  0.0724  0.0274  0.0571 -0.0006 -0.0399 -0.0157       0.1981
## X2600.HK  0.0696 -0.0316 -0.0312  0.0042  0.0044  0.0034       0.5056
## X2628.HK -0.0035 -0.0176  0.0371 -0.0553 -0.0095 -0.0013       0.7091
```

```
## X3328.HK  0.0219  0.0347 -0.0058 -0.0582  0.0050 -0.0126       0.6631
## X3988.HK  0.0391 -0.0216  0.0394 -0.0431 -0.0076 -0.0682       0.2490
```

3.7 Downside Deviation - Distinct

```
##                                0001.HK 0002.HK 0003.HK 0004.HK 0005.HK
## Downside Deviation (MAR = 0%)  0.0192  0.0089  0.0156  0.0242  0.0256
##                                0006.HK 0011.HK 0012.HK 0013.HK 0016.HK
## Downside Deviation (MAR = 0%)  0.0111  0.0151  0.0214  0.0193  0.0197
##                                0017.HK 0019.HK 0023.HK 0066.HK 0083.HK
## Downside Deviation (MAR = 0%)  0.0246   0.021  0.0207  0.0133  0.0256
##                                0101.HK 0144.HK 0151.HK 0267.HK 0291.HK
## Downside Deviation (MAR = 0%)  0.0253   0.027  0.0218  0.0256  0.0228
##                                0293.HK 0322.HK 0330.HK 0386.HK 0388.HK
## Downside Deviation (MAR = 0%)  0.0214  0.0201  0.0355  0.0207  0.0199
##                                0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
## Downside Deviation (MAR = 0%)  0.0384   0.026  0.0247  0.0229  0.0205
##                                0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
## Downside Deviation (MAR = 0%)  0.0211  0.0241   0.021   0.016  0.0205
##                                1088.HK 1109.HK 1199.HK 1299.HK 1398.HK
## Downside Deviation (MAR = 0%)  0.0246   0.029   0.029    0.02  0.0217
##                                1880.HK 1898.HK 2318.HK 2388.HK 2600.HK
## Downside Deviation (MAR = 0%)  0.0273  0.0301  0.0269    0.02  0.0299
##                                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	770	12	56.00	91.312	98.025	99.925
X0002.HK.Close	770	12	51.10	52.562	57.225	59.181
X0003.HK.Close	770	12	10.78	17.205	18.120	17.593
X0004.HK.Close	770	12	15.20	36.700	41.650	41.755
X0005.HK.Close	770	12	33.00	65.862	79.000	74.935
X0006.HK.Close	770	12	41.10	43.500	47.100	48.955
X0011.HK.Close	770	12	67.00	102.700	110.550	109.485
X0012.HK.Close	770	12	23.75	42.638	48.500	46.936
X0013.HK.Close	770	12	36.40	52.525	57.850	63.931
X0016.HK.Close	770	12	55.80	100.100	111.000	108.111
X0017.HK.Close	770	12	6.20	9.650	13.530	12.735
X0019.HK.Close	770	12	42.90	84.550	92.500	92.597
X0023.HK.Close	770	12	12.34	26.562	28.925	28.185
X0066.HK.Close	770	12	16.14	25.113	26.850	26.026
X0083.HK.Close	770	12	5.60	11.850	13.610	13.068
X0101.HK.Close	770	12	13.66	25.613	29.075	28.608
X0144.HK.Close	770	12	12.20	23.050	26.300	25.937
X0151.HK.Close	770	12	2.77	4.652	6.170	5.819
X0267.HK.Close	770	12	7.18	14.220	17.300	17.089
X0291.HK.Close	770	12	10.66	23.688	27.900	26.061
X0293.HK.Close	770	12	6.98	12.560	14.720	15.168
X0322.HK.Close	770	12	8.27	16.170	19.190	18.156
X0330.HK.Close	770	12	7.93	32.837	42.500	39.316
X0386.HK.Close	770	12	3.65	6.190	6.780	6.804
X0388.HK.Close	770	12	54.60	122.800	135.800	136.492
X0494.HK.Close	760	22	11.60	16.900	32.075	29.172
X0688.HK.Close	770	12	9.41	14.225	15.440	15.201
X0700.HK.Close	779	3	41.80	127.300	155.000	147.563
X0762.HK.Close	777	5	8.31	9.630	10.980	11.880
X0836.HK.Close	770	12	11.10	14.205	15.360	15.440
X0857.HK.Close	770	12	5.10	8.680	9.370	9.293
X0883.HK.Close	770	12	6.08	11.100	13.190	13.537
X0939.HK.Close	770	12	3.66	5.610	6.255	6.115
X0941.HK.Close	770	12	63.00	73.250	75.800	75.613
X1044.HK.Close	782	0	24.25	47.125	58.525	56.058
X1088.HK.Close	770	12	13.90	29.950	33.200	31.616
X1109.HK.Close	770	12	7.50	12.880	14.560	14.398
X1199.HK.Close	770	12	5.40	9.375	10.920	11.113
X1299.HK.Close	317	465	19.86	22.700	24.000	24.364
X1398.HK.Close	770	12	3.03	4.963	5.730	5.462
X1880.HK.Close	770	12	2.98	7.975	11.810	11.017
X1898.HK.Close	770	12	4.43	9.470	10.600	10.446
X2318.HK.Close	770	12	30.35	57.900	64.350	65.394
X2388.HK.Close	770	12	6.30	16.680	18.400	18.697
X2600.HK.Close	770	12	3.20	5.680	7.030	6.686
X2628.HK.Close	770	12	17.24	25.750	30.500	29.692
X3328.HK.Close	770	12	4.17	6.270	8.000	7.602
X3988.HK.Close	770	12	1.84	3.050	3.935	3.665

	Geometric Mean	Quartile 3	Maximum	SE Mean	LCL Mean (0.95)
X0001.HK.Close	98.558	113.900	135.70	0.5862	98.775
X0002.HK.Close	58.826	64.050	75.00	0.2382	58.713
X0003.HK.Close	17.456	18.980	21.00	0.0755	17.445
X0004.HK.Close	40.024	51.237	62.00	0.4007	40.968

```
## X0005.HK.Close          73.894     83.100   98.00  0.4268          74.097
## X0006.HK.Close          48.599     53.650   64.80  0.2198          48.523
## X0011.HK.Close         108.714    118.500  134.00  0.4572         108.588
## X0012.HK.Close          46.115     53.150   60.50  0.2972          46.353
## X0013.HK.Close          61.987     77.925   95.90  0.5779          62.796
## X0016.HK.Close         106.376    118.700  146.30  0.6535         106.828
## X0017.HK.Close          12.274     15.320   18.54  0.1196          12.500
## X0019.HK.Close          90.143    109.150  136.40  0.7225          91.179
## X0023.HK.Close          27.644     32.150   35.90  0.1834          27.825
## X0066.HK.Close          25.800     28.250   31.15  0.1179          25.795
## X0083.HK.Close          12.802     14.800   18.56  0.0902          12.891
## X0101.HK.Close          28.009     32.350   40.30  0.2023          28.211
## X0144.HK.Close          25.394     28.900   37.55  0.1832          25.578
## X0151.HK.Close           5.666      6.960    8.19  0.0494           5.722
## X0267.HK.Close          16.593     20.600   24.40  0.1436          16.807
## X0291.HK.Close          25.042     30.788   35.25  0.2371          25.595
## X0293.HK.Close          14.637     18.330   24.05  0.1467          14.880
## X0322.HK.Close          17.510     20.850   25.95  0.1625          17.837
## X0330.HK.Close          35.444     50.450   64.30  0.5284          38.278
## X0386.HK.Close           6.723      7.610    9.64  0.0390           6.727
## X0388.HK.Close         132.581    160.825  197.50  1.0874         134.357
## X0494.HK.Close          26.750     38.825   51.90  0.4201          28.347
## X0688.HK.Close          15.073     16.640   19.44  0.0707          15.063
## X0700.HK.Close         137.370    180.050  225.00  1.6936         144.239
## X0762.HK.Close          11.651     14.280   17.40  0.0904          11.703
## X0836.HK.Close          15.355     16.640   20.15  0.0603          15.321
## X0857.HK.Close           9.189     10.120   12.36  0.0504           9.194
## X0883.HK.Close          13.100     16.495   20.95  0.1244          13.293
## X0939.HK.Close           6.047      6.810    8.28  0.0338           6.048
## X0941.HK.Close          75.509     78.000   91.45  0.1441          75.330
## X1044.HK.Close          53.875     67.900   78.25  0.5122          55.053
## X1088.HK.Close          30.958     35.250   40.80  0.2104          31.203
## X1109.HK.Close          14.158     16.355   20.00  0.0939          14.214
## X1199.HK.Close          10.875     12.700   16.76  0.0852          10.945
## X1299.HK.Close          24.289     26.150   29.55  0.1102          24.147
## X1398.HK.Close           5.398      5.987    7.03  0.0311           5.401
## X1880.HK.Close          10.256     14.255   17.54  0.1390          10.744
## X1898.HK.Close          10.209     11.760   15.86  0.0789          10.291
## X2318.HK.Close          63.908     76.300   94.30  0.4864          64.440
## X2388.HK.Close          17.908     22.938   28.95  0.1848          18.334
## X2600.HK.Close           6.467      7.878   10.66  0.0624           6.563
## X2628.HK.Close          29.064     34.500   41.00  0.2148          29.270
## X3328.HK.Close           7.451      8.715   10.56  0.0557           7.493
## X3988.HK.Close           3.605      4.147    5.00  0.0256           3.615
##                 UCL Mean (0.95)  Variance   Stdev Skewness Kurtosis
## X0001.HK.Close          101.076  264.5540 16.2651  -0.0872  -0.1460
## X0002.HK.Close           59.648   43.7039  6.6109   0.3906  -1.2222
## X0003.HK.Close           17.741    4.3872  2.0946  -1.6089   2.0158
## X0004.HK.Close           42.541  123.6320 11.1190  -0.4630  -0.2287
## X0005.HK.Close           75.772  140.2806 11.8440  -0.7864   0.1909
## X0006.HK.Close           49.386   37.2010  6.0993   0.6642  -0.7801
## X0011.HK.Close          110.382  160.9224 12.6855  -0.5319  -0.0053
## X0012.HK.Close           47.520   67.9955  8.2459  -0.8845   0.2420
## X0013.HK.Close           65.065  257.1295 16.0353   0.3670  -1.0137
## X0016.HK.Close          109.394  328.8198 18.1334  -0.8403   0.6229
## X0017.HK.Close           12.969   11.0092  3.3180  -0.5414  -0.9105
## X0019.HK.Close           94.015  401.9149 20.0478  -0.4578  -0.0071
```

```
## X0023.HK.Close          28.545   25.9057  5.0898  -1.2078   1.0124
## X0066.HK.Close          26.258   10.7009  3.2712  -1.3615   1.1874
## X0083.HK.Close          13.245    6.2644  2.5029  -1.0180   0.7155
## X0101.HK.Close          29.005   31.5247  5.6147  -0.5249  -0.0152
## X0144.HK.Close          26.297   25.8422  5.0835  -0.5140   0.2964
## X0151.HK.Close           5.916    1.8769  1.3700  -0.5294  -0.8268
## X0267.HK.Close          17.370   15.8830  3.9854  -0.4456  -0.5995
## X0291.HK.Close          26.526   43.2744  6.5783  -1.0061  -0.1308
## X0293.HK.Close          15.456   16.5616  4.0696   0.1236  -0.7605
## X0322.HK.Close          18.475   20.3440  4.5104  -0.7895  -0.2080
## X0330.HK.Close          40.353  214.9961 14.6627  -0.7162  -0.4586
## X0386.HK.Close           6.880    1.1682  1.0808  -0.4501   0.5072
## X0388.HK.Close         138.626  910.4329 30.1734  -0.5555   0.2859
## X0494.HK.Close          29.996  134.0975 11.5800  -0.0102  -1.4344
## X0688.HK.Close          15.340    3.8518  1.9626  -0.7302   0.0703
## X0700.HK.Close         150.888 2234.2809 47.2682  -0.6996  -0.2834
## X0762.HK.Close          12.058    6.3508  2.5201   0.7254  -0.9146
## X0836.HK.Close          15.558    2.7980  1.6727   0.1480  -0.3310
## X0857.HK.Close           9.392    1.9529  1.3975  -0.7314   0.7309
## X0883.HK.Close          13.782   11.9193  3.4524  -0.0597  -0.7323
## X0939.HK.Close           6.181    0.8822  0.9392  -0.7264   0.0374
## X0941.HK.Close          75.896   15.9813  3.9977   0.0154   0.7618
## X1044.HK.Close          57.064  205.1491 14.3230  -0.7410  -0.5891
## X1088.HK.Close          32.028   34.0766  5.8375  -1.3677   1.3774
## X1109.HK.Close          14.582    6.7937  2.6065  -0.4243  -0.1941
## X1199.HK.Close          11.280    5.5901  2.3643   0.0801  -0.5309
## X1299.HK.Close          24.581    3.8479  1.9616   0.3154  -0.9778
## X1398.HK.Close           5.523    0.7440  0.8626  -0.9522   0.3465
## X1880.HK.Close          11.290   14.8770  3.8571  -0.4377  -0.9343
## X1898.HK.Close          10.601    4.7915  2.1889  -0.5191   0.3010
## X2318.HK.Close          66.349  182.1687 13.4970  -0.2068  -0.3414
## X2388.HK.Close          19.060   26.3005  5.1284  -0.4061  -0.2584
## X2600.HK.Close           6.808    3.0007  1.7323  -0.4282  -0.7318
## X2628.HK.Close          30.113   35.5389  5.9614  -0.3869  -0.9466
## X3328.HK.Close           7.711    2.3889  1.5456  -0.4813  -0.8987
## X3988.HK.Close           3.716    0.5065  0.7117  -0.8053  -0.3477
```

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   0.000  0.0000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000   0.000   0.000  0.0000  0.0000
## Beta CoVariance  0.9887  0.1470  0.3776   1.112   1.121  0.1142  0.6389
## Beta CoSkewness  1.0147 -0.5969 -0.4611   1.870   0.930 -0.1960  0.9730
## Beta CoKurtosis  0.9986  0.0865  0.3595   1.120   1.280  0.0890  0.7197
##                 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  0.9476  1.0040  1.1363  0.7846  0.9397  0.5092
## Beta CoSkewness   2.075  0.0604  1.3891  0.5787  1.4467  1.8985  0.2137
## Beta CoKurtosis   1.075  0.9007  0.9864  1.1280  0.7974  0.9847  0.4532
##                 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   1.166   1.092   1.310  0.4311  1.0805  0.8783  0.7658
## Beta CoSkewness   1.250   2.874   1.483 -1.5339  1.2888  0.1324  1.0505
## Beta CoKurtosis   1.172   1.166   1.208  0.3369  0.9848  0.7634  0.7537
##                 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  0.3479  0.9372  0.9548   1.159  0.9712   1.187  0.9321
## Beta CoSkewness -0.1987 -0.8195 -0.1085   1.822  2.1768   3.879  1.6679
## Beta CoKurtosis  0.3078  0.8984  0.8895   1.145  0.9754   1.263  0.8976
##                 0762.HK 0836.HK 0857.HK 0883.HK 0939.HK 0941.HK 1044.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  0.7066  0.5556  1.1005   1.282  1.0621  0.7100  0.4622
## Beta CoSkewness -0.5716 -0.8457  0.5149   0.849  0.5854  0.6943  0.0193
## Beta CoKurtosis  0.5420  0.4930  1.0089   1.209  1.0421  0.7032  0.3954
##                 1088.HK 1109.HK 1199.HK 1299.HK 1398.HK 1880.HK 1898.HK
## CoSkewness       0.0000   0.000  0.0000  0.0000   0.000  0.0000  0.0000
## CoKurtosis       0.0000   0.000  0.0000  0.0000   0.000  0.0000  0.0000
## Beta CoVariance  1.2140   1.165  1.3296  0.8235   1.129  0.8285  1.4968
## Beta CoSkewness  0.9615   3.502  0.6742  1.7711   1.002  0.1898  0.9424
## Beta CoKurtosis  1.0928   1.141  1.2568  0.9855   1.067  0.7701  1.3887
##                 2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## CoSkewness        0.000  0.0000   0.000  0.0000   0.000  0.0000
## CoKurtosis        0.000  0.0000   0.000  0.0000   0.000  0.0000
## Beta CoVariance   1.330  0.8775   1.541  1.0966   1.194  1.0330
## Beta CoSkewness   2.125  0.8244   2.216  0.8932   0.979  0.2574
## Beta CoKurtosis   1.319  0.8493   1.449  1.0404   1.185  0.9703
```

4.2 Higher Moments - Combined

```
##                 HSI Components to HSI Combined
## CoSkewness                              0.0000
## CoKurtosis                              0.0000
## Beta CoVariance                         1.1862
## Beta CoSkewness                         0.5333
## Beta CoKurtosis                         1.1227
```

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     4.9115 1.45620 1.19451 1.18034 1.03801 1.00306
## Proportion of Variance 0.5026 0.04418 0.02973 0.02903 0.02245 0.02096
## Cumulative Proportion  0.5026 0.54674 0.57646 0.60549 0.62794 0.64890
##                         Comp.7  Comp.8  Comp.9 Comp.10 Comp.11 Comp.12
## Standard deviation     0.96396 0.94829 0.91176 0.89122 0.86403 0.84977
## Proportion of Variance 0.01936 0.01873 0.01732 0.01655 0.01555 0.01504
## Cumulative Proportion  0.66826 0.68699 0.70431 0.72086 0.73641 0.75145
##                        Comp.13 Comp.14 Comp.15 Comp.16 Comp.17 Comp.18
## Standard deviation     0.81725 0.80885 0.76899 0.76079 0.74847 0.71790
## Proportion of Variance 0.01391 0.01363 0.01232 0.01206 0.01167 0.01074
## Cumulative Proportion  0.76537 0.77900 0.79132 0.80338 0.81505 0.82578
##                        Comp.19 Comp.20  Comp.21  Comp.22  Comp.23  Comp.24
## Standard deviation     0.70779 0.70495 0.683869 0.651929 0.650123 0.643033
## Proportion of Variance 0.01044 0.01035 0.009743 0.008854 0.008805 0.008614
## Cumulative Proportion  0.83622 0.84657 0.856317 0.865171 0.873977 0.882591
##                         Comp.25  Comp.26  Comp.27  Comp.28  Comp.29
## Standard deviation     0.622547 0.618589 0.604930 0.595355 0.574130
## Proportion of Variance 0.008074 0.007972 0.007624 0.007384 0.006867
## Cumulative Proportion  0.890666 0.898637 0.906261 0.913646 0.920513
##                         Comp.30  Comp.31 Comp.32  Comp.33  Comp.34
## Standard deviation     0.562068 0.558939 0.53443 0.525714 0.511149
## Proportion of Variance 0.006582 0.006509 0.00595 0.005758 0.005443
## Cumulative Proportion  0.927094 0.933603 0.93955 0.945311 0.950754
##                         Comp.35  Comp.36  Comp.37  Comp.38  Comp.39
## Standard deviation     0.496176 0.491715 0.478189 0.461781 0.450666
## Proportion of Variance 0.005129 0.005037 0.004764 0.004443 0.004231
## Cumulative Proportion  0.955883 0.960921 0.965684 0.970127 0.974358
##                         Comp.40  Comp.41 Comp.42  Comp.43  Comp.44
## Standard deviation     0.435808 0.417623 0.39009 0.386887 0.370237
## Proportion of Variance 0.003957 0.003634 0.00317 0.003118 0.002856
## Cumulative Proportion  0.978315 0.981949 0.98512 0.988237 0.991093
##                         Comp.45  Comp.46  Comp.47  Comp.48
## Standard deviation     0.348802 0.328509 0.323397 0.305571
## Proportion of Variance 0.002535 0.002248 0.002179 0.001945
## Cumulative Proportion  0.993628 0.995876 0.998055 1.000000

##
## Loadings:
##          Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
## X0001.HK -0.173        -0.141 -0.168                              0.123
## X0002.HK         0.471        -0.128  0.161        -0.258        -0.147
## X0003.HK         0.347        -0.292 -0.128                       0.121
## X0004.HK -0.161        -0.128
## X0005.HK -0.166
## X0006.HK         0.486                0.135        -0.380         0.134
## X0011.HK -0.154        -0.128 -0.256  0.120                0.154 -0.147
## X0012.HK -0.162        -0.144 -0.119                0.139         0.173
## X0013.HK -0.165        -0.111 -0.148
## X0016.HK -0.173        -0.143                                     0.202
## X0017.HK -0.146        -0.210                              -0.152  0.279
## X0019.HK -0.124               -0.283         0.162  0.107 -0.264 -0.141
## X0023.HK -0.153               -0.141  0.195                0.168 -0.288
## X0066.HK -0.139  0.148        -0.209         0.168               -0.222
```

```
## X0083.HK -0.154        -0.209                                        0.256
## X0101.HK -0.152        -0.192               -0.112         0.159
## X0144.HK -0.153                0.108 -0.100 -0.133 -0.139 -0.137  0.163
## X0151.HK        -0.104  0.504 -0.179 -0.131  0.185        -0.136  0.268
## X0267.HK -0.160                              0.127
## X0291.HK -0.127                             -0.103 -0.215 -0.191
## X0293.HK -0.130 -0.115        -0.126        -0.215 -0.130 -0.303 -0.207
## X0322.HK        -0.123  0.469 -0.347                      0.284  0.126
## X0330.HK        -0.103               -0.411  0.325 -0.491 -0.110 -0.288
## X0386.HK -0.138  0.240         0.188 -0.218 -0.142  0.191 -0.140
## X0388.HK -0.172                              0.149
## X0494.HK                       0.108         0.301 -0.178  0.426  0.317
## X0688.HK -0.155 -0.186         0.135               -0.156  0.119
## X0700.HK -0.136         0.125  0.102  0.254 -0.175        -0.199
## X0762.HK -0.125  0.142  0.249  0.180        -0.157  0.165        -0.137
## X0836.HK                      -0.158 -0.658 -0.330         0.180
## X0857.HK -0.156  0.171         0.164 -0.120         0.143
## X0883.HK -0.167                0.154
## X0939.HK -0.174                0.104                0.151
## X0941.HK -0.123  0.299  0.135                       0.110 -0.191 -0.114
## X1044.HK -0.103 -0.117  0.339 -0.132  0.190 -0.162 -0.174 -0.165
## X1088.HK -0.165                                             0.103
## X1109.HK -0.154 -0.224         0.103               -0.132  0.124
## X1199.HK -0.156                0.216               -0.135         0.135
## X1299.HK -0.132                                   -0.357         0.299 -0.115
## X1398.HK -0.180                0.122                       0.116
## X1880.HK -0.130         0.100                     -0.294 -0.252
## X1898.HK -0.159                                    0.203         0.113 -0.164
## X2318.HK -0.168                0.108               0.106  0.121
## X2388.HK -0.162                       0.130                        -0.209
## X2600.HK -0.159                0.153
## X2628.HK -0.160                0.117         0.186
## X3328.HK -0.174                0.138                       0.112
## X3988.HK -0.174                                            0.134  0.106
##          Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15 Comp.16 Comp.17
## X0001.HK                                  0.118           -0.125
## X0002.HK                 -0.115   0.148                    0.227
## X0003.HK  0.119   0.328          -0.261                   -0.128  -0.131
## X0004.HK                                  0.226            0.247   0.177
## X0005.HK                 -0.203
## X0006.HK  0.206  -0.360                            -0.241  -0.118
## X0011.HK          0.112  -0.100           0.106
## X0012.HK                  0.117   0.173                    0.210  -0.104
## X0013.HK -0.131                  -0.200            0.115
## X0016.HK                                  0.107
## X0017.HK                 -0.328          -0.184            0.116  -0.179
## X0019.HK         -0.408   0.205  -0.283                           -0.161
## X0023.HK                  0.139           0.119   0.139  -0.187
## X0066.HK -0.162   0.136                                    -0.260   0.315
## X0083.HK  0.107                   0.309           -0.200           -0.104
## X0101.HK -0.119           0.109  -0.112  -0.140            0.177
## X0144.HK -0.134          -0.113                    0.237  -0.186
## X0151.HK  0.103                  -0.181   0.225  -0.129
## X0267.HK         -0.108                   0.142   0.204   0.106
## X0291.HK  0.185   0.206   0.472          -0.409   0.210   0.141
## X0293.HK -0.220  -0.220                  -0.161   0.188
## X0322.HK  0.174  -0.108  -0.149   0.242  -0.260   0.342           0.144
```

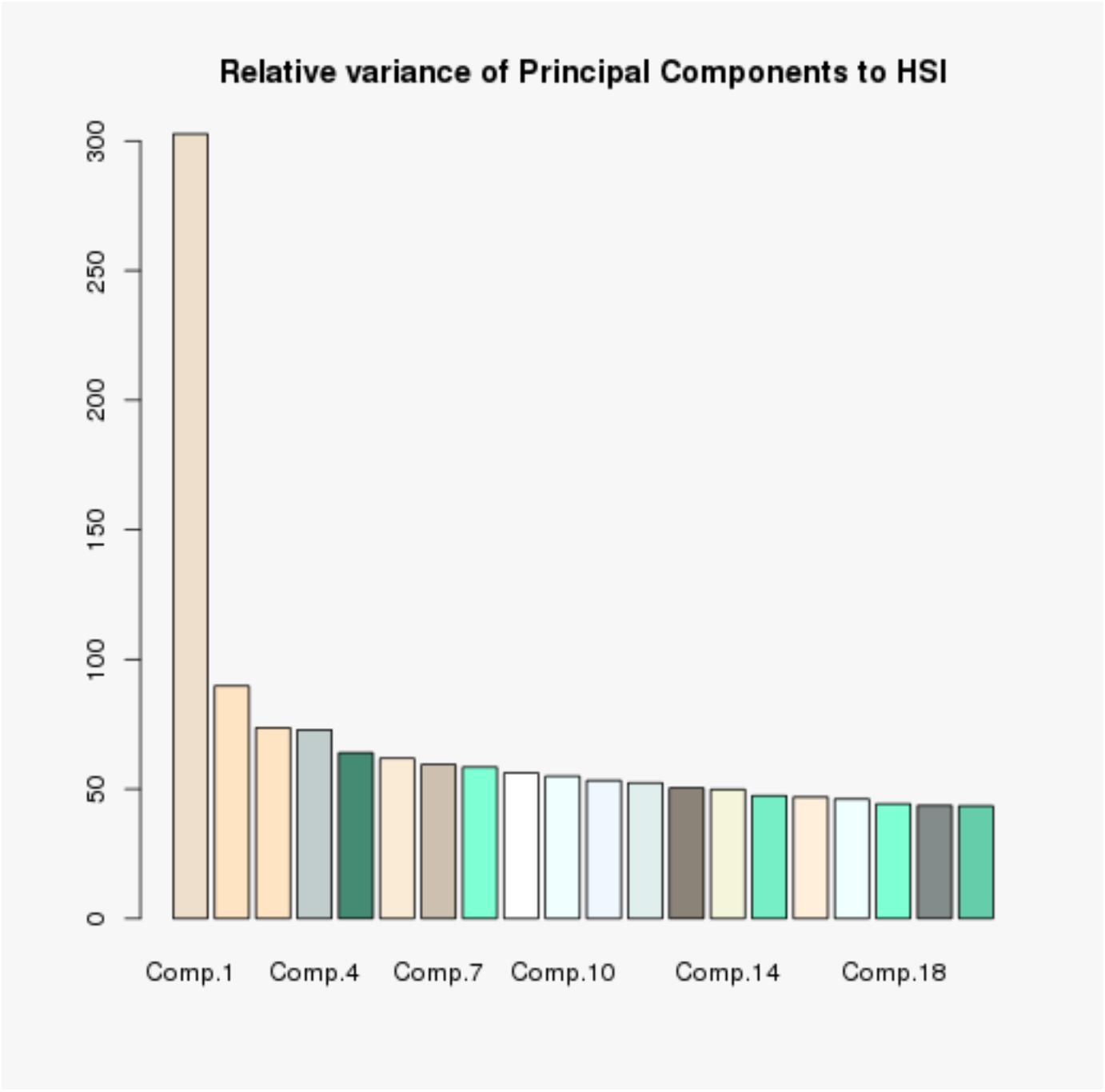
```
## X0330.HK -0.105   0.218  -0.133   0.127                   0.102  -0.150
## X0386.HK -0.106                  -0.163                           0.166
## X0388.HK                 -0.120                                   0.142
## X0494.HK -0.528  -0.149   0.338                   0.112          -0.180
## X0688.HK  0.317   0.108   0.127           0.191          -0.101
## X0700.HK -0.108                           0.270   0.157  -0.144
## X0762.HK                          0.234   0.154           0.432  -0.302
## X0836.HK         -0.310           0.142          -0.159  -0.185
## X0857.HK -0.117           0.106                   0.125   0.113   0.285
## X0883.HK                                          0.101           0.101
## X0939.HK                          0.103  -0.229          -0.144  -0.203
## X0941.HK          0.211   0.148   0.182   0.124   0.146  -0.193  -0.263
## X1044.HK -0.311   0.125   0.199   0.145          -0.569           0.190
## X1088.HK                          -0.199   0.119           0.102
## X1109.HK  0.281           0.225           0.194
## X1199.HK                 -0.204                           -0.213   0.153
## X1299.HK -0.117   0.276  -0.247  -0.164          -0.102   0.132
## X1398.HK  0.104                           -0.230
## X1880.HK                          -0.418                           -0.213
## X1898.HK         -0.123           -0.145  -0.106
## X2318.HK         -0.174
## X2388.HK -0.100           -0.131  -0.114  -0.155                   -0.153
## X2600.HK  0.140                                                    0.218   0.157
## X2628.HK                                                                   0.337
## X3328.HK                                  -0.145  -0.196  -0.113
## X3988.HK                          0.159  -0.246          -0.208  -0.126
##          Comp.18 Comp.19 Comp.20 Comp.21 Comp.22 Comp.23 Comp.24 Comp.25
## X0001.HK           0.134                            -0.156
## X0002.HK  0.153    0.133
## X0003.HK -0.373  -0.266   0.129  -0.167   0.206   0.153          -0.169
## X0004.HK  0.145                  -0.158  -0.157  -0.203   0.158   0.154
## X0005.HK         -0.178                    0.310  -0.159   0.152
## X0006.HK -0.119                                   -0.129           0.153
## X0011.HK                  0.224                    0.167
## X0012.HK           0.154                                          -0.157
## X0013.HK           0.124                           -0.224  -0.192  -0.216
## X0016.HK                          0.167                   -0.159
## X0017.HK                 -0.128                    0.176
## X0019.HK         -0.330           0.172                   -0.235   0.231
## X0023.HK  0.117           0.213   0.106   0.178                   0.320
## X0066.HK  0.305          -0.178  -0.116           0.287           0.134
## X0083.HK                          0.128   0.171
## X0101.HK -0.180   0.360  -0.114          -0.153   0.157   0.162   0.302
## X0144.HK  0.117  -0.189   0.321   0.137  -0.192           0.157
## X0151.HK           0.163   0.202  -0.128          -0.101   0.158   0.281
## X0267.HK                                  0.145   0.173  -0.114  -0.174
## X0291.HK  0.180           0.140  -0.336          -0.173  -0.153
## X0293.HK -0.341                           0.155  -0.115   0.453
## X0322.HK                 -0.221   0.158
## X0330.HK -0.158   0.175                                   -0.173   0.140
## X0386.HK -0.107                   0.123  -0.206   0.199
## X0388.HK  0.103  -0.121          -0.228                           -0.190
## X0494.HK         -0.142  -0.102
## X0688.HK -0.108  -0.109           0.115           0.102           -0.142
## X0700.HK -0.370   0.185          -0.329  -0.117   0.179  -0.386
## X0762.HK  0.101  -0.219          -0.282   0.165
## X0836.HK                          -0.183
```

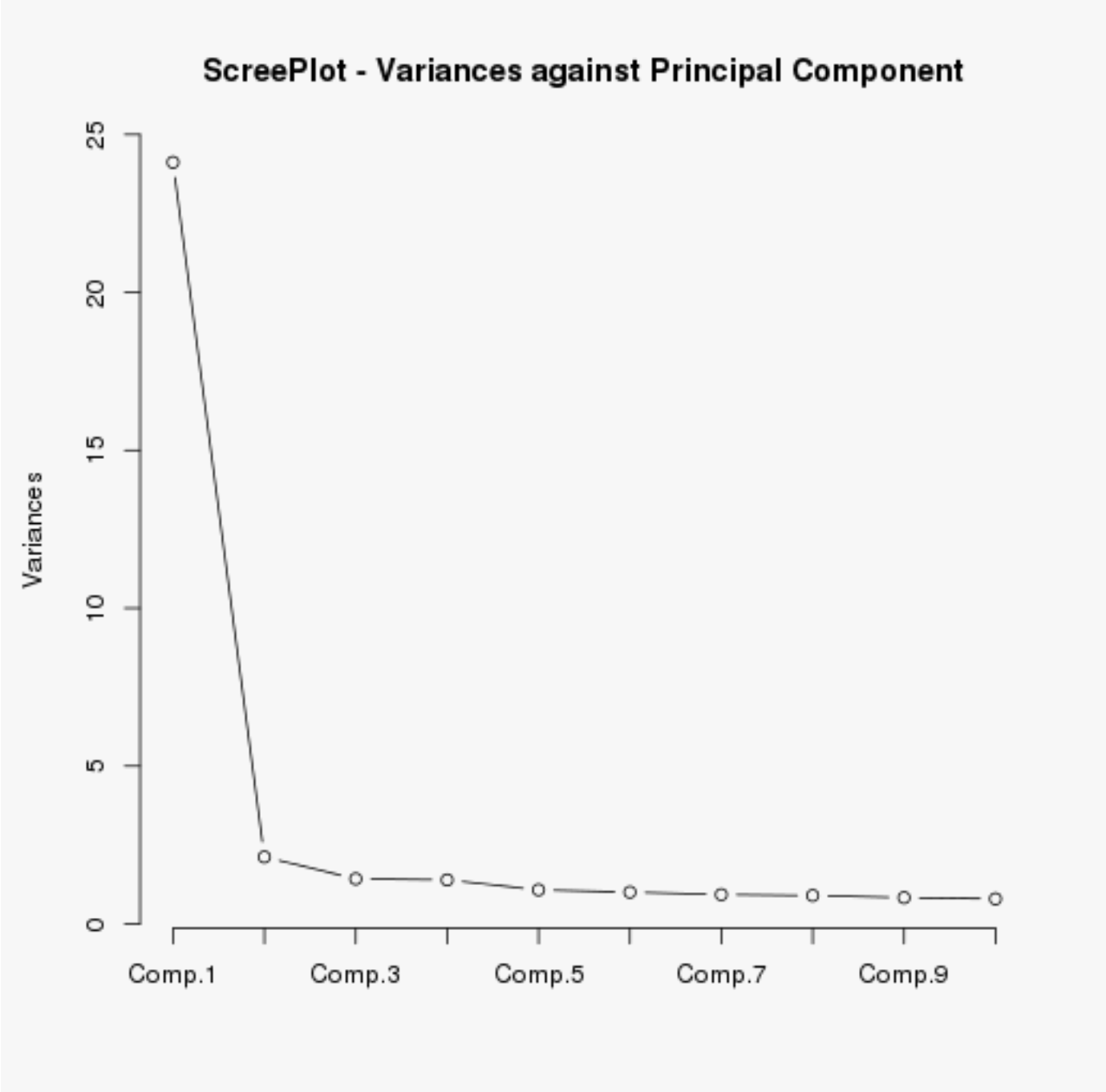
```
## X0857.HK          0.136           0.210   0.134                                  
## X0883.HK          0.100   0.108   0.156   0.407          -0.238                  
## X0939.HK                                                  0.104                  
## X0941.HK                  -0.303   0.194  -0.300  -0.208   0.185  -0.107         
## X1044.HK                           0.142                           -0.179         
## X1088.HK          0.198   0.303   0.121                   0.129                  
## X1109.HK -0.103  -0.162                   -0.114                                 
## X1199.HK  0.184  -0.208                           -0.113  -0.101   0.191         
## X1299.HK         -0.297  -0.159   0.123  -0.242  -0.299  -0.197   0.151         
## X1398.HK                                                                        
## X1880.HK  0.340   0.107  -0.400           0.345   0.211   0.173                 
## X1898.HK          0.155           0.231                   -0.148  -0.291         
## X2318.HK -0.151           -0.184  -0.158          -0.201                         
## X2388.HK  0.101           0.190  -0.189  -0.124                   -0.301         
## X2600.HK         -0.195                   -0.185   0.375   0.105   0.141         
## X2628.HK -0.172           -0.293  -0.181          -0.215   0.223                 
## X3328.HK                                                                        
## X3988.HK          0.100                                                  0.118  
##          Comp.26 Comp.27 Comp.28 Comp.29 Comp.30 Comp.31 Comp.32 Comp.33
## X0001.HK  0.171                                   -0.138           -0.129
## X0002.HK                  -0.145          -0.384   0.263  -0.164   0.211
## X0003.HK          0.179                           -0.176                 
## X0004.HK  0.187   0.261                    0.184  -0.273                 
## X0005.HK         -0.229           0.256  -0.227          -0.191         
## X0006.HK                   0.135           0.325           0.106         
## X0011.HK -0.168  -0.124  -0.138           0.397          -0.303         
## X0012.HK          0.177   0.267   0.224                  -0.261         
## X0013.HK  0.225  -0.109   0.254   0.265                   0.284         
## X0016.HK                                          -0.170  -0.111  -0.310
## X0017.HK         -0.212  -0.227  -0.224                   0.426   0.161
## X0019.HK                  -0.220   0.151  -0.119                         
## X0023.HK         -0.146  -0.133                   -0.149   0.227         
## X0066.HK                   0.335                    0.146   0.117         
## X0083.HK -0.169  -0.243                            0.285                 
## X0101.HK -0.174   0.232  -0.170          -0.233           0.135         
## X0144.HK -0.261   0.162           0.343                           0.196  
## X0151.HK                   0.146  -0.292           0.121  -0.116         
## X0267.HK -0.441   0.353   0.120  -0.230   0.126                   0.137  
## X0291.HK -0.179  -0.205                                                   
## X0293.HK  0.128           0.272  -0.269  -0.127                           
## X0322.HK                          0.173                           -0.191  
## X0330.HK                          0.209   0.161                           
## X0386.HK         -0.108   0.113           0.224   0.192          -0.237  
## X0388.HK  0.202                           0.198                           
## X0494.HK                         -0.101           0.117  -0.115         
## X0688.HK  0.189                  -0.152           0.178                 
## X0700.HK -0.102  -0.165                                                   
## X0762.HK                                          -0.106   0.246  -0.235
## X0836.HK         -0.109  -0.163                   -0.154  -0.143   0.124
## X0857.HK  0.230          -0.175  -0.153                                   
## X0883.HK  0.229   0.118  -0.137  -0.110                           0.345  
## X0939.HK  0.106   0.185                                           0.110  
## X0941.HK         -0.103  -0.171                   -0.225           0.137  
## X1044.HK          0.103                           -0.171   0.163         
## X1088.HK -0.227  -0.117           0.127  -0.206   0.189   0.250  -0.119
## X1109.HK  0.176                                   0.191          -0.123  
## X1199.HK          0.277  -0.122  -0.107  -0.271          -0.113  -0.355
```

```
## X1299.HK                  0.171  -0.155           0.117           0.131
## X1398.HK
## X1880.HK                                  0.136
## X1898.HK -0.197  -0.191   0.201  -0.294  -0.202  -0.346
## X2318.HK -0.111   0.155
## X2388.HK                 -0.293  -0.114                  -0.199  -0.345
## X2600.HK  0.126  -0.259   0.157   0.151  -0.117  -0.384  -0.151   0.114
## X2628.HK -0.268  -0.156  -0.183                           0.113
## X3328.HK                                                         0.182
## X3988.HK          0.127           0.113                   0.113
##          Comp.34 Comp.35 Comp.36 Comp.37 Comp.38 Comp.39 Comp.40 Comp.41
## X0001.HK  0.134   0.196                   0.297   0.167   0.107   0.275
## X0002.HK                          0.131   0.176   0.170
## X0003.HK         -0.204
## X0004.HK -0.368  -0.214   0.142           0.135  -0.264   0.120
## X0005.HK -0.327   0.331  -0.147  -0.303   0.180  -0.117          -0.182
## X0006.HK          0.185          -0.117
## X0011.HK          0.174   0.327          -0.111          -0.353
## X0012.HK          0.229  -0.101   0.293  -0.205                  -0.252
## X0013.HK                         -0.139                  -0.253   0.136
## X0016.HK  0.146           0.188                   0.190   0.304
## X0017.HK          0.184           0.261                   -0.129  -0.156
## X0019.HK                  0.149  -0.112
## X0023.HK                 -0.426   0.259           0.147
## X0066.HK  0.108           0.166  -0.101          -0.258          -0.182
## X0083.HK -0.113  -0.468  -0.162  -0.169          -0.151           0.260
## X0101.HK                         -0.366   0.145          -0.120
## X0144.HK  0.224  -0.228                   0.239           0.108  -0.210
## X0151.HK  0.144          -0.115
## X0267.HK -0.143   0.289  -0.263                                   0.223
## X0291.HK          0.126
## X0293.HK                  0.103
## X0322.HK                                          -0.157
## X0330.HK
## X0386.HK -0.212                   0.148   0.257   0.103  -0.205   0.129
## X0388.HK -0.189  -0.259          -0.163  -0.179   0.484          -0.171
## X0494.HK
## X0688.HK                  0.189           0.187  -0.121  -0.104
## X0700.HK -0.141                           -0.112                  -0.136
## X0762.HK  0.167           0.188           0.100
## X0836.HK
## X0857.HK                 -0.157                   -0.140   0.118  -0.270
## X0883.HK  0.195           0.174  -0.171  -0.139                   0.140
## X0939.HK -0.161                  -0.241  -0.135   0.148           0.120
## X0941.HK                         -0.129  -0.186          -0.108   0.107
## X1044.HK
## X1088.HK -0.259           0.204          -0.452           0.190   0.135
## X1109.HK          0.114                                           -0.137
## X1199.HK                          0.135  -0.178          -0.383   0.180
## X1299.HK                 -0.113                           0.214
## X1398.HK                          0.151                   0.133  -0.169
## X1880.HK
## X1898.HK         -0.207          -0.115   0.190          -0.172  -0.263
## X2318.HK  0.279  -0.229  -0.250          -0.172  -0.256  -0.320
## X2388.HK  0.122   0.103  -0.204                  -0.377   0.245   0.145
## X2600.HK  0.249          -0.168          -0.168           0.123   0.308
## X2628.HK  0.315           0.143   0.104           0.230   0.179
```

```
## X3328.HK -0.189           0.237   0.380   0.259  -0.162           0.235
## X3988.HK                                          0.159
##          Comp.42 Comp.43 Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## X0001.HK  0.152  -0.157  -0.337                   0.525
## X0002.HK -0.155  -0.122
## X0003.HK
## X0004.HK -0.201           0.168
## X0005.HK         -0.219
## X0006.HK  0.110   0.120
## X0011.HK -0.235
## X0012.HK  0.156   0.248   0.177  -0.271   0.109
## X0013.HK -0.211   0.158                           -0.410  -0.117
## X0016.HK -0.146  -0.217   0.119   0.420  -0.117  -0.346   0.236
## X0017.HK                                          0.135
## X0019.HK          0.119          -0.143
## X0023.HK  0.116           0.130  -0.143          -0.116   0.132
## X0066.HK  0.141
## X0083.HK          0.167          -0.110                   -0.116
## X0101.HK  0.244                                  -0.100
## X0144.HK
## X0151.HK
## X0267.HK                          0.115          -0.121
## X0291.HK
## X0293.HK
## X0322.HK
## X0330.HK
## X0386.HK         -0.139   0.357
## X0388.HK  0.336          -0.226   0.110   0.207
## X0494.HK
## X0688.HK         -0.207          -0.229   0.472  -0.210   0.155
## X0700.HK          0.134
## X0762.HK
## X0836.HK
## X0857.HK -0.289   0.167  -0.470  -0.114
## X0883.HK  0.330           0.334   0.131           0.107
## X0939.HK -0.115  -0.164          -0.401  -0.407           0.398
## X0941.HK                          0.120                   -0.132
## X1044.HK         -0.117
## X1088.HK         -0.212                   0.112
## X1109.HK          0.275           0.262  -0.498   0.213  -0.140
## X1199.HK                          -0.160
## X1299.HK
## X1398.HK         -0.283                           -0.225  -0.733
## X1880.HK -0.152
## X1898.HK                                          0.157
## X2318.HK         -0.386  -0.147   0.185           0.141   0.169
## X2388.HK          0.112   0.147
## X2600.HK
## X2628.HK          0.145   0.169  -0.290
## X3328.HK  0.206   0.270  -0.301   0.240          -0.211   0.221
## X3988.HK -0.453   0.215   0.211   0.294   0.445   0.263
##
##                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  0.187   0.208   0.229   0.250   0.271   0.292   0.312
##                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   0.437   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   0.562   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   0.687   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   0.812   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   0.937   0.958   0.979   1.000
```


Relative variance of Principal Components to HSI
300
250
200
150
100
50
0
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)

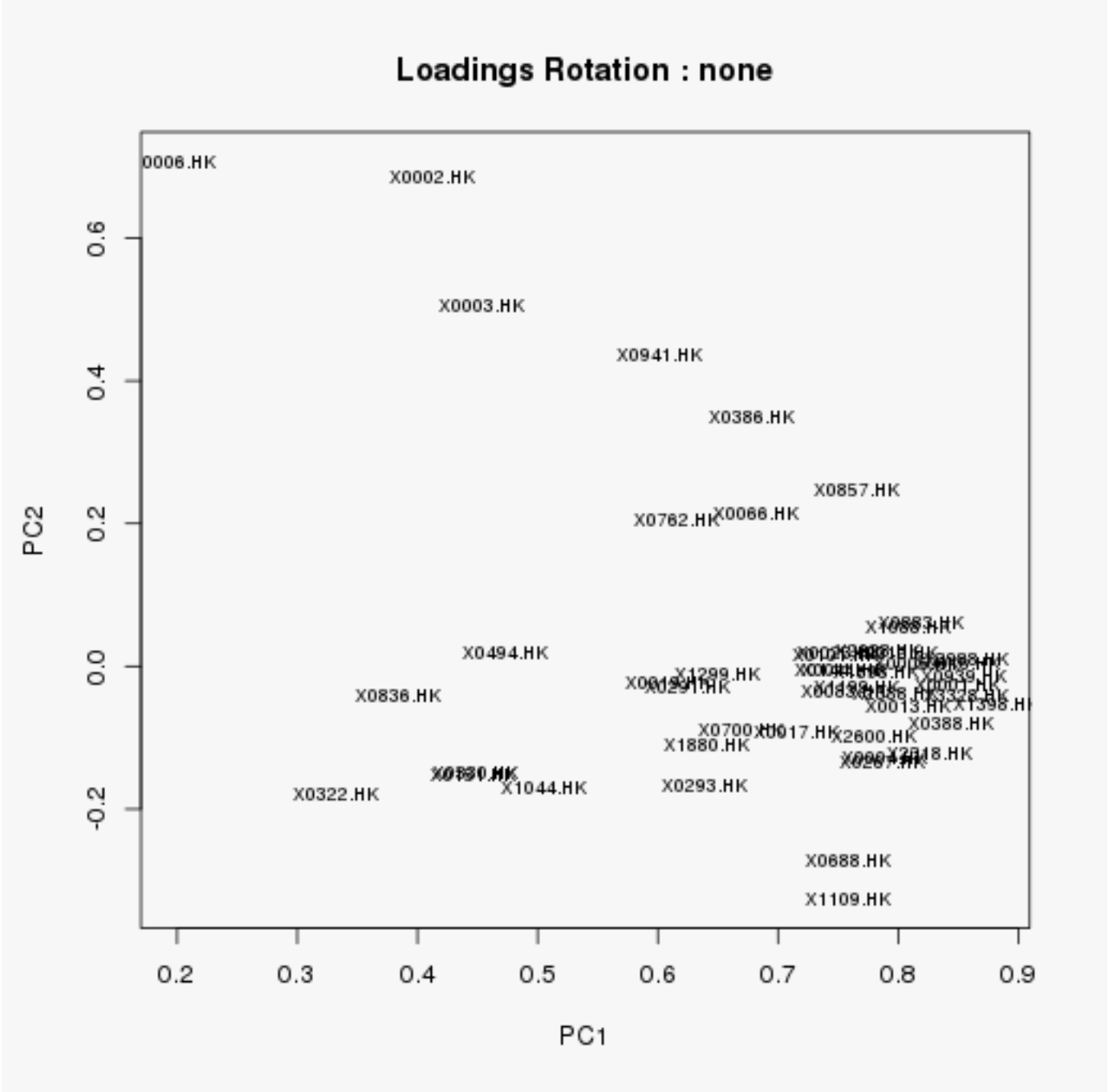
[7] http://en.wikipedia.org/wiki/Factoranalysis

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 0.88 -0.05  0.05 -0.14 -0.05 0.81 0.19
## X3988.HK   48 0.86  0.01  0.04 -0.10  0.01 0.75 0.25
## X3328.HK   47 0.86 -0.04 -0.01 -0.16  0.03 0.76 0.24
## X0939.HK   33 0.85 -0.01  0.11 -0.12  0.00 0.76 0.24
## X0001.HK    1 0.85 -0.03 -0.17  0.20 -0.06 0.79 0.21
## X0016.HK   10 0.85  0.01 -0.17  0.11 -0.08 0.77 0.23
## X0388.HK   25 0.84 -0.08 -0.07  0.07 -0.05 0.73 0.27
## X2318.HK   43 0.83 -0.12 -0.01 -0.13 -0.06 0.72 0.28
## X0883.HK   32 0.82  0.06  0.07 -0.18 -0.03 0.71 0.29
## X0005.HK    5 0.81  0.01 -0.01 -0.11 -0.02 0.68 0.32
## X1088.HK   36 0.81  0.06  0.11 -0.10  0.07 0.68 0.32
## X0013.HK    9 0.81 -0.06 -0.13  0.18 -0.05 0.71 0.29
## X0012.HK    8 0.80  0.02 -0.17  0.14  0.00 0.69 0.31
## X2388.HK   44 0.80 -0.04  0.00  0.08 -0.14 0.66 0.34
## X0004.HK    4 0.79 -0.13 -0.15  0.07 -0.05 0.67 0.33
## X0267.HK   19 0.79 -0.13  0.08  0.06  0.10 0.65 0.35
## X2628.HK   46 0.78  0.02  0.03 -0.14 -0.01 0.64 0.36
## X1898.HK   42 0.78 -0.01  0.01 -0.11 -0.01 0.62 0.38
## X2600.HK   45 0.78 -0.10 -0.02 -0.18 -0.05 0.65 0.35
## X0857.HK   31 0.77  0.25  0.07 -0.19  0.12 0.71 0.29
## X1199.HK   38 0.77 -0.03 -0.06 -0.26  0.04 0.66 0.34
## X0688.HK   27 0.76 -0.27 -0.03 -0.16 -0.07 0.68 0.32
## X1109.HK   37 0.76 -0.33 -0.04 -0.12  0.02 0.70 0.30
## X0011.HK    7 0.76 -0.01 -0.15  0.30 -0.13 0.70 0.30
## X0083.HK   15 0.75 -0.04 -0.25  0.10 -0.03 0.64 0.36
## X0023.HK   13 0.75  0.02 -0.02  0.17 -0.20 0.63 0.37
## X0144.HK   17 0.75  0.00  0.02 -0.13  0.10 0.59 0.41
## X0101.HK   16 0.75  0.02 -0.23  0.08  0.03 0.62 0.38
## X0017.HK   11 0.72 -0.09 -0.25  0.10  0.05 0.60 0.40
## X0066.HK   14 0.68  0.22 -0.06  0.25  0.02 0.58 0.42
## X0386.HK   24 0.68  0.35  0.11 -0.22  0.23 0.70 0.30
## X0700.HK   28 0.67 -0.09  0.15 -0.12 -0.26 0.56 0.44
## X1299.HK   39 0.65 -0.01  0.00  0.07  0.04 0.43 0.57
## X1880.HK   41 0.64 -0.11  0.12 -0.09 -0.07 0.45 0.55
## X0293.HK   21 0.64 -0.17 -0.08  0.15 -0.04 0.47 0.53
## X0291.HK   20 0.62 -0.03 -0.07  0.05  0.00 0.40 0.60
## X0762.HK   29 0.62  0.21  0.30 -0.21  0.09 0.56 0.44
## X0019.HK   12 0.61 -0.02  0.03  0.33  0.04 0.48 0.52
## X0941.HK   34 0.60  0.44  0.16 -0.05  0.07 0.59 0.41
## X1044.HK   35 0.51 -0.17  0.41  0.16 -0.20 0.51 0.49
## X0494.HK   26 0.47  0.02  0.01 -0.13 -0.07 0.25 0.75
## X0330.HK   23 0.45 -0.15 -0.06 -0.05  0.43 0.41 0.59
## X0006.HK    6 0.20  0.71 -0.05 -0.09 -0.14 0.57 0.43
## X0002.HK    2 0.41  0.69  0.03  0.15 -0.17 0.69 0.31
## X0003.HK    3 0.45  0.51  0.01  0.34  0.13 0.60 0.40
## X0151.HK   18 0.45 -0.15  0.60  0.21  0.14 0.65 0.35
## X0322.HK   22 0.33 -0.18  0.56  0.41  0.00 0.62 0.38
## X0836.HK   30 0.38 -0.04 -0.11  0.19  0.68 0.66 0.34
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.12 2.12 1.43 1.39 1.08
```

```
## Proportion Var  0.50 0.04 0.03 0.03 0.02
## Cumulative Var  0.50 0.55 0.58 0.61 0.63
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1


##              PC1       PC2
## X0001.HK 0.8490 -0.025958
## X0002.HK 0.4120  0.685215
## X0003.HK 0.4539  0.505710
## X0004.HK 0.7888 -0.128995
## X0005.HK 0.8148  0.005183
## X0006.HK 0.1973  0.707198
## X0011.HK 0.7554 -0.005791
## X0012.HK 0.7971  0.017709
## X0013.HK 0.8082 -0.055055
## X0016.HK 0.8485  0.005415
## X0017.HK 0.7157 -0.091716
## X0019.HK 0.6077 -0.023274
## X0023.HK 0.7505  0.018098
## X0066.HK 0.6819  0.215711
## X0083.HK 0.7544 -0.035313
## X0101.HK 0.7483  0.015510
## X0144.HK 0.7496 -0.003870
## X0151.HK 0.4459 -0.150996
## X0267.HK 0.7862 -0.133071
## X0291.HK 0.6240 -0.028956
## X0293.HK 0.6388 -0.167273
## X0322.HK 0.3328 -0.178914
## X0330.HK 0.4482 -0.150080
## X0386.HK 0.6781  0.350203
## X0388.HK 0.8445 -0.081210
## X0494.HK 0.4732  0.019950
## X0688.HK 0.7592 -0.270981
## X0700.HK 0.6693 -0.089443
## X0762.HK 0.6159  0.206107
## X0836.HK 0.3836 -0.042394
## X0857.HK 0.7656  0.248427
## X0883.HK 0.8181  0.060995
## X0939.HK 0.8545 -0.012769
## X0941.HK 0.6021  0.435864
## X1044.HK 0.5058 -0.170805
## X1088.HK 0.8092  0.055925
## X1109.HK 0.7575 -0.325535
## X1199.HK 0.7650 -0.027907
## X1299.HK 0.6492 -0.012116
## X1398.HK 0.8821 -0.053173
## X1880.HK 0.6406 -0.110631
## X1898.HK 0.7819 -0.007606
## X2318.HK 0.8266 -0.121542
## X2388.HK 0.7971 -0.037207
## X2600.HK 0.7789 -0.097391
```

```
## X2628.HK 0.7841  0.022880
## X3328.HK 0.8565 -0.041249
## X3988.HK 0.8570  0.009440
```



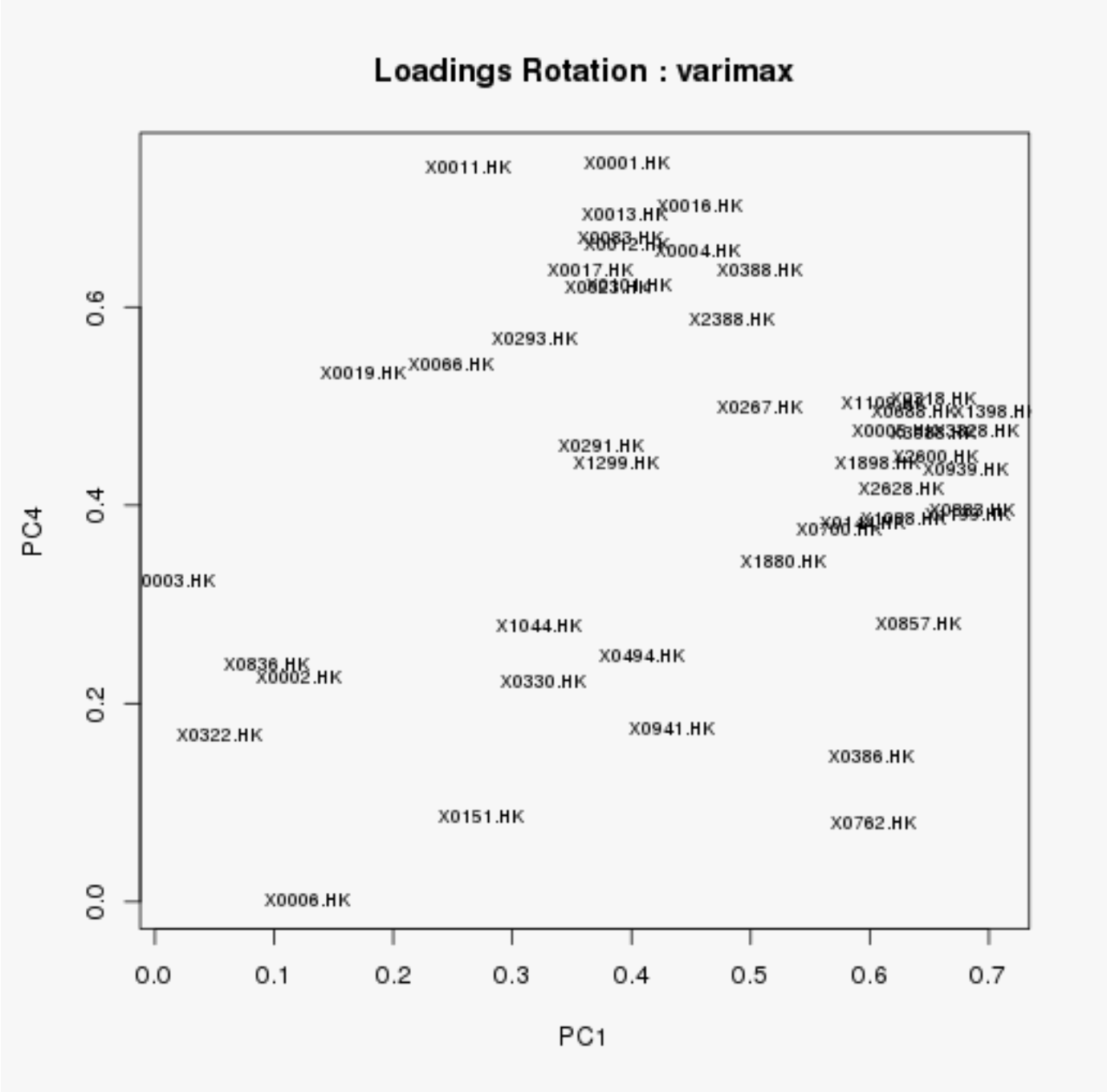
5.2.2 Rotation : varimax

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
## X1398.HK   40 0.71 0.49  0.15  0.19  0.08 0.81 0.19
## X3328.HK   47 0.69 0.47  0.15  0.12  0.16 0.76 0.24
## X0883.HK   32 0.69 0.39  0.24  0.15  0.08 0.71 0.29
## X1199.HK   38 0.68 0.39  0.12  0.01  0.16 0.66 0.34
## X0939.HK   33 0.68 0.44  0.19  0.23  0.13 0.76 0.24
## X2600.HK   45 0.65 0.45  0.07  0.10  0.08 0.65 0.35
## X3988.HK   48 0.65 0.47  0.21  0.18  0.15 0.75 0.25
## X2318.HK   43 0.65 0.51  0.07  0.15  0.08 0.72 0.28
## X0857.HK   31 0.64 0.28  0.40  0.09  0.22 0.71 0.29
## X0688.HK   27 0.64 0.50 -0.10  0.13  0.06 0.68 0.32
## X1088.HK   36 0.63 0.39  0.24  0.22  0.18 0.68 0.32
## X2628.HK   46 0.63 0.42  0.20  0.14  0.11 0.64 0.36
## X0005.HK    5 0.62 0.48  0.19  0.13  0.12 0.68 0.32
## X1109.HK   37 0.61 0.50 -0.15  0.15  0.16 0.70 0.30
## X1898.HK   42 0.61 0.44  0.17  0.14  0.11 0.62 0.38
## X0762.HK   29 0.60 0.08  0.34  0.25  0.14 0.56 0.44
## X0386.HK   24 0.60 0.15  0.47  0.07  0.29 0.70 0.30
## X0144.HK   17 0.59 0.38  0.16  0.13  0.22 0.59 0.41
## X0700.HK   28 0.57 0.38  0.08  0.24 -0.16 0.56 0.44
## X1880.HK   41 0.53 0.34  0.05  0.23  0.02 0.45 0.55
## X0267.HK   19 0.51 0.50  0.08  0.29  0.24 0.65 0.35
## X0494.HK   26 0.41 0.25  0.12  0.05  0.00 0.25 0.75
## X0001.HK    1 0.40 0.75  0.20  0.15  0.13 0.79 0.21
## X0011.HK    7 0.26 0.74  0.21  0.19  0.06 0.70 0.30
## X0016.HK   10 0.46 0.70  0.21  0.10  0.10 0.77 0.23
## X0013.HK    9 0.39 0.69  0.16  0.17  0.13 0.71 0.29
## X0083.HK   15 0.39 0.67  0.14  0.02  0.14 0.64 0.36
## X0012.HK    8 0.40 0.66  0.22  0.10  0.17 0.69 0.31
## X0004.HK    4 0.46 0.66  0.07  0.11  0.12 0.67 0.33
## X0388.HK   25 0.51 0.64  0.13  0.18  0.12 0.73 0.27
## X0017.HK   11 0.37 0.64  0.08  0.02  0.22 0.60 0.40
## X0101.HK   16 0.40 0.62  0.19  0.01  0.19 0.62 0.38
## X0023.HK   13 0.38 0.62  0.23  0.23 -0.04 0.63 0.37
## X2388.HK   44 0.48 0.59  0.17  0.23  0.02 0.66 0.34
## X0293.HK   21 0.32 0.57  0.01  0.18  0.10 0.47 0.53
## X0066.HK   14 0.25 0.54  0.40  0.17  0.17 0.58 0.42
## X0019.HK   12 0.17 0.53  0.17  0.32  0.19 0.48 0.52
## X0291.HK   20 0.37 0.46  0.12  0.11  0.13 0.40 0.60
## X1299.HK   39 0.39 0.44  0.15  0.18  0.16 0.43 0.57
## X0002.HK    2 0.12 0.23  0.78  0.05 -0.10 0.69 0.31
## X0006.HK    6 0.13 0.00  0.71 -0.17 -0.13 0.57 0.43
## X0003.HK    3 0.02 0.32  0.64  0.17  0.23 0.60 0.40
## X0941.HK   34 0.43 0.18  0.57  0.16  0.14 0.59 0.41
## X0322.HK   22 0.05 0.17  0.02  0.77  0.05 0.62 0.38
## X0151.HK   18 0.27 0.09  0.04  0.73  0.18 0.65 0.35
## X1044.HK   35 0.32 0.28  0.02  0.56 -0.12 0.51 0.49
```

```
## X0836.HK   30 0.09 0.24  0.06  0.08  0.77 0.66 0.34
## X0330.HK   23 0.33 0.22 -0.05  0.06  0.50 0.41 0.59
##
##                  PC1   PC4  PC2  PC3  PC5
## SS loadings    11.54 10.77 3.40 2.62 1.81
## Proportion Var  0.24  0.22 0.07 0.05 0.04
## Cumulative Var  0.24  0.46 0.54 0.59 0.63
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1

##               PC1      PC4
## X0001.HK 0.39624 0.745976
## X0002.HK 0.12055 0.227237
## X0003.HK 0.01528 0.324333
## X0004.HK 0.45573 0.656849
## X0005.HK 0.62097 0.475724
## X0006.HK 0.12758 0.002336
## X0011.HK 0.26216 0.740835
## X0012.HK 0.39691 0.663913
## X0013.HK 0.39422 0.693456
## X0016.HK 0.45739 0.701781
## X0017.HK 0.36584 0.638152
## X0019.HK 0.17442 0.533308
## X0023.HK 0.38011 0.619387
## X0066.HK 0.24921 0.542871
## X0083.HK 0.39078 0.670824
## X0101.HK 0.39781 0.623242
## X0144.HK 0.59485 0.382088
## X0151.HK 0.27416 0.086156
## X0267.HK 0.50679 0.498640
## X0291.HK 0.37395 0.459944
## X0293.HK 0.31897 0.567303
## X0322.HK 0.05409 0.169304
## X0330.HK 0.32632 0.222039
## X0386.HK 0.60038 0.146281
## X0388.HK 0.50836 0.638263
## X0494.HK 0.40805 0.248222
## X0688.HK 0.63751 0.495728
## X0700.HK 0.57457 0.375055
## X0762.HK 0.60212 0.079121
## X0836.HK 0.09318 0.238865
## X0857.HK 0.64099 0.280571
## X0883.HK 0.68544 0.394693
## X0939.HK 0.68012 0.437333
## X0941.HK 0.43445 0.175823
## X1044.HK 0.32308 0.278632
## X1088.HK 0.62776 0.387420
## X1109.HK 0.61173 0.503244
## X1199.HK 0.68264 0.390880
## X1299.HK 0.38688 0.443694
## X1398.HK 0.70625 0.494384
```

```
## X1880.HK 0.52781 0.344442
## X1898.HK 0.60727 0.442579
## X2318.HK 0.65283 0.508503
## X2388.HK 0.48371 0.587781
## X2600.HK 0.65491 0.448590
## X2628.HK 0.62708 0.416320
## X3328.HK 0.68997 0.474292
## X3988.HK 0.65332 0.472785
```



5.2.3 Rotation : quatimax

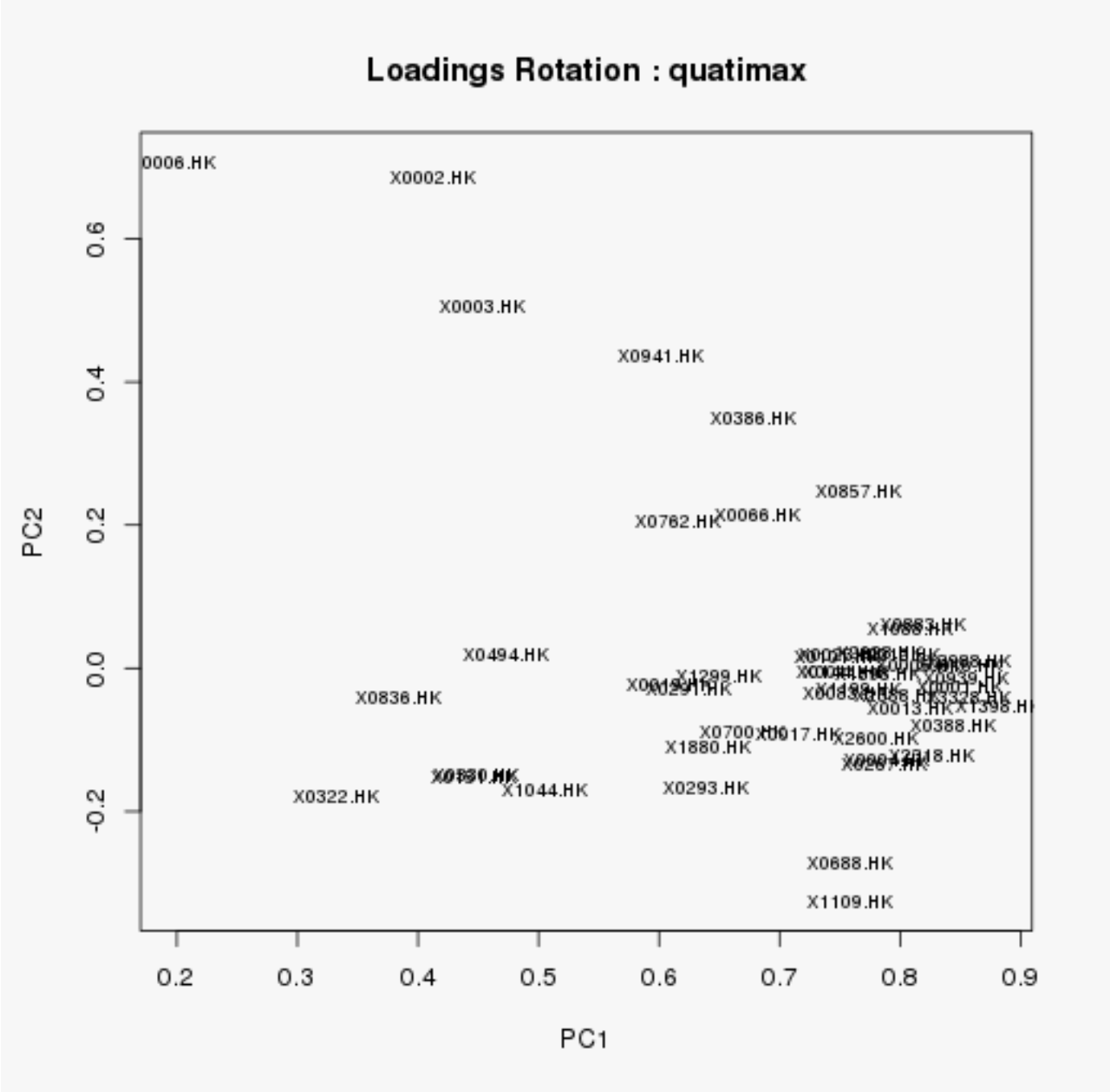
Quartimax rotation is an orthogonal alternative which minimizes the number of factors needed to explain each variable. This type of rotation often generates a general factor on which most variables are loaded to a high or medium degree. Such a factor structure is usually not helpful to the research purpose.

```
## 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 0.88 -0.05  0.05 -0.14 -0.05 0.81 0.19
## X3988.HK   48 0.86  0.01  0.04 -0.10  0.01 0.75 0.25
## X3328.HK   47 0.86 -0.04 -0.01 -0.16  0.03 0.76 0.24
## X0939.HK   33 0.85 -0.01  0.11 -0.12  0.00 0.76 0.24
## X0001.HK    1 0.85 -0.03 -0.17  0.20 -0.06 0.79 0.21
## X0016.HK   10 0.85  0.01 -0.17  0.11 -0.08 0.77 0.23
## X0388.HK   25 0.84 -0.08 -0.07  0.07 -0.05 0.73 0.27
## X2318.HK   43 0.83 -0.12 -0.01 -0.13 -0.06 0.72 0.28
## X0883.HK   32 0.82  0.06  0.07 -0.18 -0.03 0.71 0.29
## X0005.HK    5 0.81  0.01 -0.01 -0.11 -0.02 0.68 0.32
## X1088.HK   36 0.81  0.06  0.11 -0.10  0.07 0.68 0.32
## X0013.HK    9 0.81 -0.06 -0.13  0.18 -0.05 0.71 0.29
## X0012.HK    8 0.80  0.02 -0.17  0.14  0.00 0.69 0.31
## X2388.HK   44 0.80 -0.04  0.00  0.08 -0.14 0.66 0.34
## X0004.HK    4 0.79 -0.13 -0.15  0.07 -0.05 0.67 0.33
## X0267.HK   19 0.79 -0.13  0.08  0.06  0.10 0.65 0.35
## X2628.HK   46 0.78  0.02  0.03 -0.14 -0.01 0.64 0.36
## X1898.HK   42 0.78 -0.01  0.01 -0.11 -0.01 0.62 0.38
## X2600.HK   45 0.78 -0.10 -0.02 -0.18 -0.05 0.65 0.35
## X0857.HK   31 0.77  0.25  0.07 -0.19  0.12 0.71 0.29
## X1199.HK   38 0.77 -0.03 -0.06 -0.26  0.04 0.66 0.34
## X0688.HK   27 0.76 -0.27 -0.03 -0.16 -0.07 0.68 0.32
## X1109.HK   37 0.76 -0.33 -0.04 -0.12  0.02 0.70 0.30
## X0011.HK    7 0.76 -0.01 -0.15  0.30 -0.13 0.70 0.30
## X0083.HK   15 0.75 -0.04 -0.25  0.10 -0.03 0.64 0.36
## X0023.HK   13 0.75  0.02 -0.02  0.17 -0.20 0.63 0.37
## X0144.HK   17 0.75  0.00  0.02 -0.13  0.10 0.59 0.41
## X0101.HK   16 0.75  0.02 -0.23  0.08  0.03 0.62 0.38
## X0017.HK   11 0.72 -0.09 -0.25  0.10  0.05 0.60 0.40
## X0066.HK   14 0.68  0.22 -0.06  0.25  0.02 0.58 0.42
## X0386.HK   24 0.68  0.35  0.11 -0.22  0.23 0.70 0.30
## X0700.HK   28 0.67 -0.09  0.15 -0.12 -0.26 0.56 0.44
## X1299.HK   39 0.65 -0.01  0.00  0.07  0.04 0.43 0.57
## X1880.HK   41 0.64 -0.11  0.12 -0.09 -0.07 0.45 0.55
## X0293.HK   21 0.64 -0.17 -0.08  0.15 -0.04 0.47 0.53
## X0291.HK   20 0.62 -0.03 -0.07  0.05  0.00 0.40 0.60
## X0762.HK   29 0.62  0.21  0.30 -0.21  0.09 0.56 0.44
## X0019.HK   12 0.61 -0.02  0.03  0.33  0.04 0.48 0.52
## X0941.HK   34 0.60  0.44  0.16 -0.05  0.07 0.59 0.41
## X1044.HK   35 0.51 -0.17  0.41  0.16 -0.20 0.51 0.49
## X0494.HK   26 0.47  0.02  0.01 -0.13 -0.07 0.25 0.75
## X0330.HK   23 0.45 -0.15 -0.06 -0.05  0.43 0.41 0.59
## X0006.HK    6 0.20  0.71 -0.05 -0.09 -0.14 0.57 0.43
## X0002.HK    2 0.41  0.69  0.03  0.15 -0.17 0.69 0.31
## X0003.HK    3 0.45  0.51  0.01  0.34  0.13 0.60 0.40
## X0151.HK   18 0.45 -0.15  0.60  0.21  0.14 0.65 0.35
## X0322.HK   22 0.33 -0.18  0.56  0.41  0.00 0.62 0.38
## X0836.HK   30 0.38 -0.04 -0.11  0.19  0.68 0.66 0.34
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.12 2.12 1.43 1.39 1.08
## Proportion Var  0.50 0.04 0.03 0.03 0.02
## Cumulative Var  0.50 0.55 0.58 0.61 0.63
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1
```

```
##              PC1       PC2
## X0001.HK 0.8490 -0.025958
## X0002.HK 0.4120  0.685215
## X0003.HK 0.4539  0.505710
## X0004.HK 0.7888 -0.128995
## X0005.HK 0.8148  0.005183
## X0006.HK 0.1973  0.707198
## X0011.HK 0.7554 -0.005791
## X0012.HK 0.7971  0.017709
## X0013.HK 0.8082 -0.055055
## X0016.HK 0.8485  0.005415
## X0017.HK 0.7157 -0.091716
## X0019.HK 0.6077 -0.023274
## X0023.HK 0.7505  0.018098
## X0066.HK 0.6819  0.215711
## X0083.HK 0.7544 -0.035313
## X0101.HK 0.7483  0.015510
## X0144.HK 0.7496 -0.003870
## X0151.HK 0.4459 -0.150996
## X0267.HK 0.7862 -0.133071
## X0291.HK 0.6240 -0.028956
## X0293.HK 0.6388 -0.167273
## X0322.HK 0.3328 -0.178914
## X0330.HK 0.4482 -0.150080
## X0386.HK 0.6781  0.350203
## X0388.HK 0.8445 -0.081210
## X0494.HK 0.4732  0.019950
## X0688.HK 0.7592 -0.270981
## X0700.HK 0.6693 -0.089443
## X0762.HK 0.6159  0.206107
## X0836.HK 0.3836 -0.042394
## X0857.HK 0.7656  0.248427
## X0883.HK 0.8181  0.060995
## X0939.HK 0.8545 -0.012769
## X0941.HK 0.6021  0.435864
## X1044.HK 0.5058 -0.170805
## X1088.HK 0.8092  0.055925
## X1109.HK 0.7575 -0.325535
## X1199.HK 0.7650 -0.027907
## X1299.HK 0.6492 -0.012116
## X1398.HK 0.8821 -0.053173
## X1880.HK 0.6406 -0.110631
## X1898.HK 0.7819 -0.007606
```

```
## X2318.HK 0.8266 -0.121542
## X2388.HK 0.7971 -0.037207
## X2600.HK 0.7789 -0.097391
## X2628.HK 0.7841  0.022880
## X3328.HK 0.8565 -0.041249
## X3988.HK 0.8570  0.009440
```



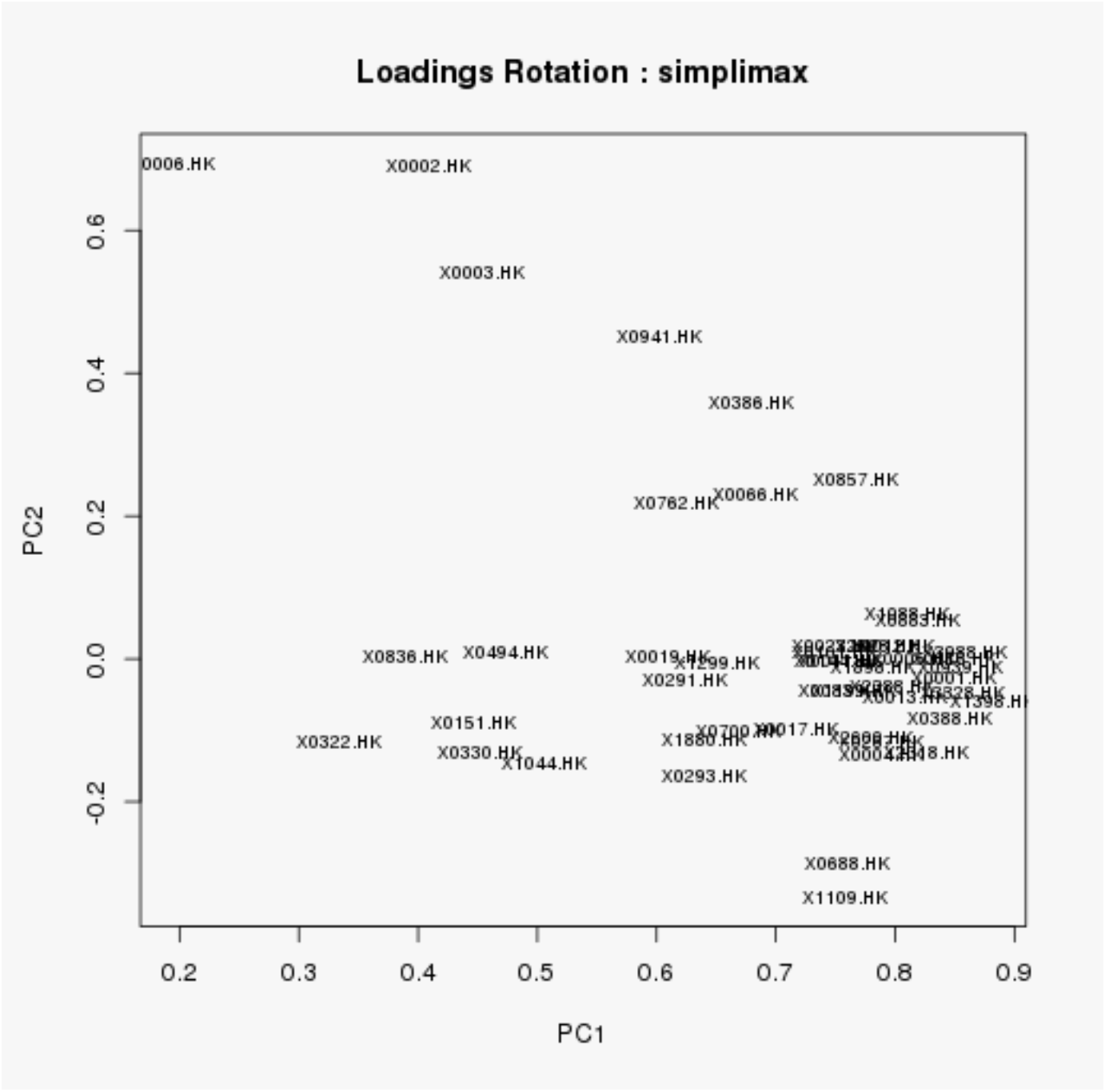
5.2.4 Rotation : simplimax

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 0.88 -0.06  0.06 -0.12 -0.05 0.81 0.19
## X3988.HK   48 0.86  0.01  0.04 -0.08  0.01 0.75 0.25
## X3328.HK   47 0.86 -0.05  0.00 -0.13  0.02 0.76 0.24
## X0939.HK   33 0.85 -0.01  0.11 -0.10  0.01 0.76 0.24
## X0001.HK    1 0.85 -0.03 -0.17  0.22 -0.11 0.79 0.21
## X0016.HK   10 0.85  0.00 -0.17  0.13 -0.12 0.77 0.23
## X0388.HK   25 0.84 -0.08 -0.06  0.09 -0.08 0.73 0.27
## X2318.HK   43 0.83 -0.13  0.00 -0.10 -0.07 0.72 0.28
## X0883.HK   32 0.82  0.05  0.07 -0.16 -0.01 0.71 0.29
## X0005.HK    5 0.81  0.00 -0.01 -0.09 -0.02 0.68 0.32
## X1088.HK   36 0.81  0.06  0.11 -0.07  0.08 0.68 0.32
## X0013.HK    9 0.81 -0.05 -0.13  0.20 -0.09 0.71 0.29
## X0012.HK    8 0.80  0.02 -0.17  0.16 -0.04 0.69 0.31
## X2388.HK   44 0.80 -0.04  0.01  0.09 -0.16 0.66 0.34
## X0004.HK    4 0.79 -0.14 -0.14  0.10 -0.09 0.67 0.33
## X0267.HK   19 0.79 -0.12  0.08  0.09  0.08 0.65 0.35
## X2628.HK   46 0.78  0.02  0.03 -0.12  0.00 0.64 0.36
## X1898.HK   42 0.78 -0.01  0.02 -0.09 -0.01 0.62 0.38
## X2600.HK   45 0.78 -0.11 -0.01 -0.16 -0.05 0.65 0.35
## X0857.HK   31 0.77  0.25  0.06 -0.17  0.16 0.71 0.29
## X1199.HK   38 0.77 -0.04 -0.06 -0.23  0.05 0.66 0.34
## X0688.HK   27 0.76 -0.29 -0.01 -0.13 -0.09 0.68 0.32
## X1109.HK   37 0.76 -0.33 -0.02 -0.08  0.00 0.70 0.30
## X0011.HK    7 0.76  0.00 -0.15  0.32 -0.18 0.70 0.30
## X0083.HK   15 0.75 -0.05 -0.25  0.12 -0.08 0.64 0.36
## X0144.HK   17 0.75  0.00  0.02 -0.10  0.11 0.59 0.41
## X0023.HK   13 0.75  0.02 -0.01  0.17 -0.23 0.63 0.37
## X0101.HK   16 0.75  0.01 -0.23  0.10 -0.01 0.62 0.38
## X0017.HK   11 0.72 -0.10 -0.25  0.13  0.01 0.60 0.40
## X0066.HK   14 0.68  0.23 -0.08  0.26  0.00 0.58 0.42
## X0386.HK   24 0.68  0.36  0.08 -0.20  0.28 0.70 0.30
## X0700.HK   28 0.67 -0.10  0.17 -0.11 -0.25 0.56 0.44
## X1299.HK   39 0.65  0.00  0.00  0.09  0.02 0.43 0.57
## X1880.HK   41 0.64 -0.11  0.13 -0.07 -0.07 0.45 0.55
## X0293.HK   21 0.64 -0.16 -0.07  0.17 -0.09 0.47 0.53
## X0291.HK   20 0.62 -0.03 -0.06  0.07 -0.02 0.40 0.60
## X0762.HK   29 0.62  0.22  0.28 -0.20  0.15 0.56 0.44
## X0019.HK   12 0.61  0.00  0.03  0.36  0.00 0.48 0.52
## X0941.HK   34 0.60  0.45  0.13 -0.05  0.12 0.59 0.41
## X1044.HK   35 0.51 -0.15  0.42  0.17 -0.19 0.51 0.49
## X0494.HK   26 0.47  0.01  0.01 -0.12 -0.06 0.25 0.75
## X0330.HK   23 0.45 -0.13 -0.07  0.00  0.41 0.41 0.59
## X0006.HK    6 0.19  0.69 -0.07 -0.12 -0.08 0.57 0.43
## X0002.HK    2 0.41  0.69  0.00  0.12 -0.13 0.69 0.31
## X0003.HK    3 0.45  0.54 -0.03  0.35  0.14 0.60 0.40
## X0151.HK   18 0.45 -0.09  0.60  0.24  0.15 0.65 0.35
## X0322.HK   22 0.33 -0.12  0.56  0.43  0.00 0.62 0.38
## X0836.HK   30 0.39  0.00 -0.15  0.24  0.65 0.66 0.34
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.12 2.12 1.43 1.39 1.08
## Proportion Var  0.50 0.04 0.03 0.03 0.02
## Cumulative Var  0.50 0.55 0.58 0.61 0.63
##
##  With component correlations of
##       PC1   PC2   PC3   PC4   PC5
## PC1  1.00  0.00  0.00 -0.03  0.01
## PC2  0.00  1.00  0.00 -0.03 -0.14
## PC3  0.00  0.00  1.00  0.01 -0.03
## PC4 -0.03 -0.03  0.01  1.00  0.03
## PC5  0.01 -0.14 -0.03  0.03  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  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1

##             PC1        PC2
## X0001.HK 0.8492 -0.0250739
## X0002.HK 0.4096  0.6915150
## X0003.HK 0.4539  0.5399705
## X0004.HK 0.7893 -0.1352559
## X0005.HK 0.8150 -0.0010739
## X0006.HK 0.1947  0.6940477
## X0011.HK 0.7552 -0.0010983
## X0012.HK 0.7976  0.0180813
## X0013.HK 0.8086 -0.0528054
## X0016.HK 0.8485 -0.0008602
## X0017.HK 0.7167 -0.0966883
## X0019.HK 0.6085  0.0046929
## X0023.HK 0.7496  0.0180816
## X0066.HK 0.6820  0.2318139
## X0083.HK 0.7548 -0.0450983
## X0101.HK 0.7489  0.0096949
## X0144.HK 0.7506 -0.0024197
## X0151.HK 0.4473 -0.0897670
## X0267.HK 0.7876 -0.1169092
## X0291.HK 0.6244 -0.0282252
## X0293.HK 0.6393 -0.1641658
## X0322.HK 0.3335 -0.1157053
## X0330.HK 0.4516 -0.1316418
## X0386.HK 0.6789  0.3596282
## X0388.HK 0.8448 -0.0817904
## X0494.HK 0.4729  0.0099359
## X0688.HK 0.7596 -0.2864649
## X0700.HK 0.6680 -0.1012382
## X0762.HK 0.6161  0.2195418
## X0836.HK 0.3885  0.0030316
## X0857.HK 0.7661  0.2510985
## X0883.HK 0.8181  0.0547554
## X0939.HK 0.8548 -0.0114998
## X0941.HK 0.6017  0.4506651
```

```
## X1044.HK 0.5052 -0.1450132
## X1088.HK 0.8098  0.0630345
## X1109.HK 0.7588 -0.3335771
## X1199.HK 0.7656 -0.0437971
## X1299.HK 0.6498 -0.0040893
## X1398.HK 0.8822 -0.0601140
## X1880.HK 0.6406 -0.1117069
## X1898.HK 0.7821 -0.0125209
## X2318.HK 0.8268 -0.1316699
## X2388.HK 0.7967 -0.0377783
## X2600.HK 0.7791 -0.1108864
## X2628.HK 0.7843  0.0178553
## X3328.HK 0.8570 -0.0483828
## X3988.HK 0.8573  0.0087685
```


Loadings Rotation : simplimax
0006.HK
X0002.HK
X0003.HK
X0941.HK
X0386.HK
X0857.HK
X0066.HK
X0762.HK
X0836.HK
X0494.HK
X0019.HK
X1299.HK
X0291.HK
X0388.HK
X0151.HK
X0322.HK
X0330.HK
X1044.HK
X1880.HK
X0293.HK
X0688.HK
X1109.HK
PC2
PC1
0.6
0.4
0.2
0.0
-0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

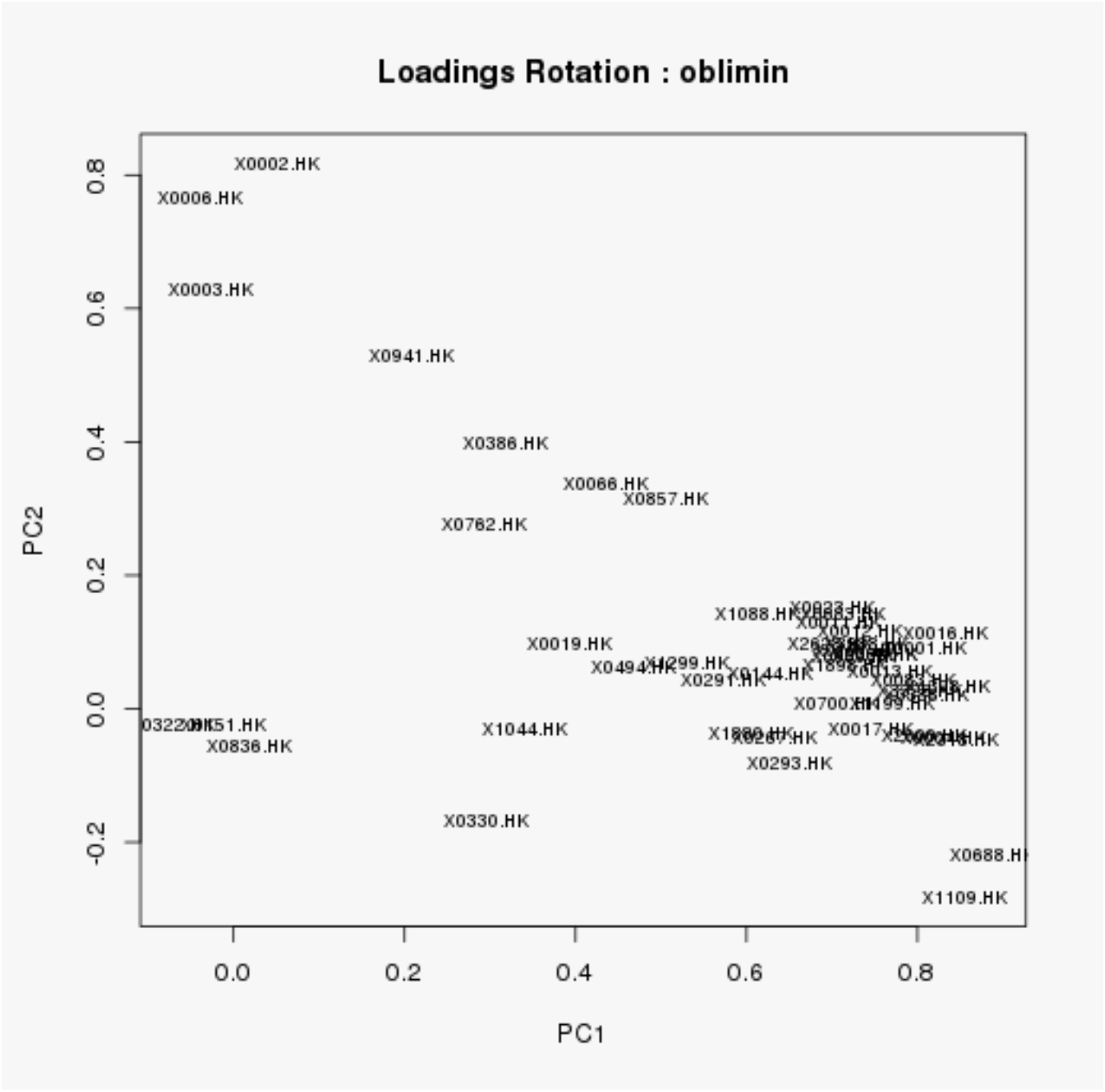
5.2.5 Rotation : oblimin

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   PC4   PC5   h2   u2
## X0688.HK   27  0.89 -0.22  0.00  0.09 -0.06 0.68 0.32
## X1109.HK   37  0.86 -0.28  0.03  0.08  0.05 0.70 0.30
## X2318.HK   43  0.85 -0.05  0.03  0.10 -0.03 0.72 0.28
## X1398.HK   40  0.83  0.03  0.07  0.15 -0.03 0.81 0.19
## X0016.HK   10  0.83  0.11 -0.03 -0.16  0.03 0.77 0.23
## X0004.HK    4  0.83 -0.04 -0.02 -0.14  0.04 0.67 0.33
## X0388.HK   25  0.81  0.02  0.06 -0.09  0.04 0.73 0.27
## X2600.HK   45  0.81 -0.04 -0.02  0.14 -0.03 0.65 0.35
## X0001.HK    1  0.81  0.09  0.02 -0.23  0.07 0.79 0.21
## X3328.HK   47  0.80  0.03  0.01  0.17  0.05 0.76 0.24
## X0083.HK   15  0.79  0.04 -0.12 -0.18  0.08 0.64 0.36
## X1199.HK   38  0.77  0.01 -0.11  0.22  0.06 0.66 0.34
## X0013.HK    9  0.77  0.06  0.05 -0.20  0.07 0.71 0.29
## X0005.HK    5  0.75  0.08  0.02  0.11  0.02 0.68 0.32
## X2388.HK   44  0.75  0.08  0.12 -0.09 -0.07 0.66 0.34
## X0017.HK   11  0.74 -0.03 -0.11 -0.16  0.17 0.60 0.40
## X3988.HK   48  0.74  0.10  0.08  0.14  0.05 0.75 0.25
## X0012.HK    8  0.73  0.12 -0.02 -0.17  0.12 0.69 0.31
## X0101.HK   16  0.73  0.09 -0.11 -0.13  0.14 0.62 0.38
## X0939.HK   33  0.73  0.08  0.13  0.18  0.02 0.76 0.24
## X1898.HK   42  0.71  0.07  0.03  0.12  0.02 0.62 0.38
## X0883.HK   32  0.71  0.14  0.05  0.21 -0.02 0.71 0.29
## X0011.HK    7  0.71  0.13  0.07 -0.34  0.02 0.70 0.30
## X0700.HK   28  0.71  0.01  0.15  0.09 -0.28 0.56 0.44
## X0023.HK   13  0.70  0.15  0.12 -0.19 -0.12 0.63 0.37
## X2628.HK   46  0.70  0.10  0.04  0.16  0.01 0.64 0.36
## X0293.HK   21  0.65 -0.08  0.08 -0.18  0.04 0.47 0.53
## X0267.HK   19  0.63 -0.04  0.21  0.02  0.16 0.65 0.35
## X0144.HK   17  0.63  0.05  0.04  0.18  0.13 0.59 0.41
## X1088.HK   36  0.61  0.14  0.13  0.19  0.09 0.68 0.32
## X1880.HK   41  0.61 -0.04  0.15  0.11 -0.07 0.45 0.55
## X0291.HK   20  0.57  0.04  0.03 -0.05  0.07 0.40 0.60
## X1299.HK   39  0.53  0.07  0.10 -0.03  0.10 0.43 0.57
## X0857.HK   31  0.51  0.31  0.02  0.29  0.14 0.71 0.29
## X0494.HK   26  0.47  0.06 -0.01  0.11 -0.06 0.25 0.75
## X0066.HK   14  0.43  0.34  0.10 -0.18  0.14 0.58 0.42
## X0019.HK   12  0.39  0.10  0.27 -0.24  0.16 0.48 0.52
## X0002.HK    2  0.05  0.82  0.03 -0.06 -0.09 0.69 0.31
## X0006.HK    6 -0.04  0.77 -0.19  0.11 -0.11 0.57 0.43
## X0003.HK    3 -0.03  0.63  0.16 -0.16  0.27 0.60 0.40
## X0941.HK   34  0.21  0.53  0.13  0.21  0.10 0.59 0.41
## X0386.HK   24  0.32  0.40  0.03  0.38  0.23 0.70 0.30
## X0322.HK   22 -0.07 -0.02  0.82 -0.12  0.02 0.62 0.38
## X0151.HK   18 -0.01 -0.02  0.77  0.12  0.12 0.65 0.35
## X1044.HK   35  0.34 -0.03  0.54 -0.02 -0.21 0.51 0.49
## X0762.HK   29  0.29  0.28  0.22  0.38  0.06 0.56 0.44
## X0836.HK   30  0.02 -0.06  0.08  0.02  0.80 0.66 0.34
## X0330.HK   23  0.30 -0.17  0.01  0.15  0.47 0.41 0.59
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    20.84 3.32 2.62 1.49 1.86
## Proportion Var  0.43 0.07 0.05 0.03 0.04
## Cumulative Var  0.43 0.50 0.56 0.59 0.63
##
##  With component correlations of
##      PC1  PC2  PC3   PC4   PC5
## PC1 1.00 0.39 0.45  0.12  0.38
## PC2 0.39 1.00 0.15  0.03  0.18
## PC3 0.45 0.15 1.00  0.06  0.16
## PC4 0.12 0.03 0.06  1.00 -0.02
## PC5 0.38 0.18 0.16 -0.02  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  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1

##                PC1       PC2
## X0001.HK  0.80739  0.091999
## X0002.HK  0.05088  0.817669
## X0003.HK -0.02624  0.629459
## X0004.HK  0.83026 -0.043116
## X0005.HK  0.75084  0.082985
## X0006.HK -0.03938  0.766415
## X0011.HK  0.70724  0.128059
## X0012.HK  0.73322  0.116133
## X0013.HK  0.76663  0.055235
## X0016.HK  0.83318  0.112610
## X0017.HK  0.74401 -0.030466
## X0019.HK  0.39179  0.099012
## X0023.HK  0.70017  0.153123
## X0066.HK  0.43494  0.338536
## X0083.HK  0.79438  0.042919
## X0101.HK  0.72877  0.088530
## X0144.HK  0.62677  0.053305
## X0151.HK -0.01205 -0.024525
## X0267.HK  0.63395 -0.042519
## X0291.HK  0.57317  0.041802
## X0293.HK  0.65078 -0.081971
## X0322.HK -0.07061 -0.024693
## X0330.HK  0.29645 -0.167141
## X0386.HK  0.31856  0.399639
## X0388.HK  0.80911  0.021163
## X0494.HK  0.46818  0.063647
## X0688.HK  0.88861 -0.219687
## X0700.HK  0.70633  0.008321
## X0762.HK  0.29299  0.275882
## X0836.HK  0.01743 -0.056383
## X0857.HK  0.50524  0.313931
## X0883.HK  0.71228  0.141016
## X0939.HK  0.72630  0.076898
## X0941.HK  0.20727  0.530445
```

```
## X1044.HK  0.33980 -0.031838
## X1088.HK  0.61167  0.141224
## X1109.HK  0.85630 -0.282233
## X1199.HK  0.76907  0.006544
## X1299.HK  0.53049  0.069076
## X1398.HK  0.83393  0.034083
## X1880.HK  0.60543 -0.036724
## X1898.HK  0.71461  0.066953
## X2318.HK  0.84540 -0.047359
## X2388.HK  0.74900  0.080533
## X2600.HK  0.80864 -0.038372
## X2628.HK  0.69858  0.097447
## X3328.HK  0.80325  0.026071
## X3988.HK  0.74045  0.096215
```


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
X0006.HK
X0003.HK
X0941.HK
X0386.HK
X0066.HK
X0857.HK
X0762.HK
X1088.HK
X0019.HK
X0016.HK
X0494.HK
X0291.HK
X0836.HK
X1044.HK
X0293.HK
X0330.HK
X0688.HK
X1109.HK

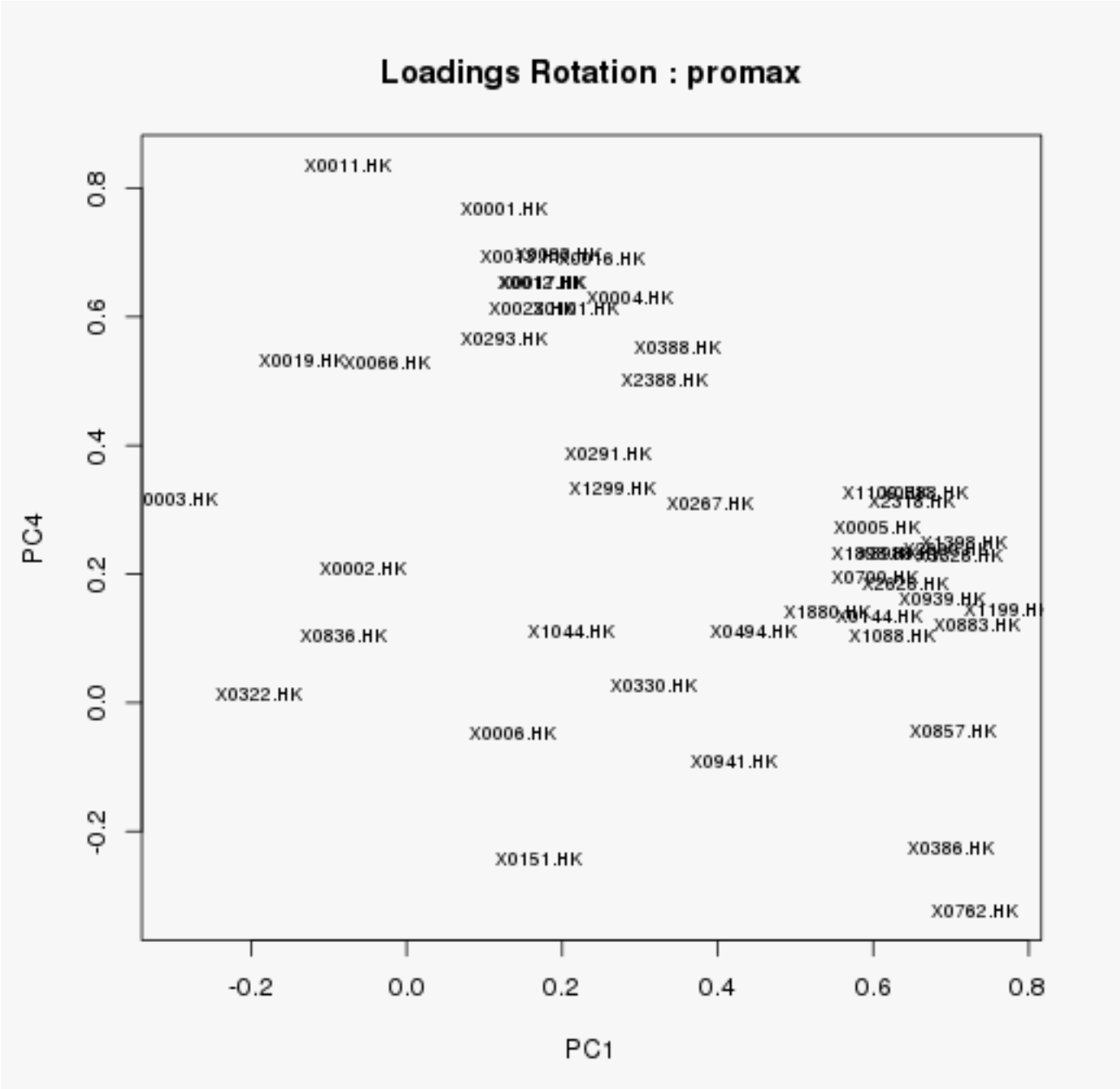
5.2.6 Rotation : promax

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
## X1199.HK   38  0.77  0.14 -0.04 -0.16  0.03 0.66 0.34
## X0883.HK   32  0.73  0.12  0.10  0.00 -0.05 0.71 0.29
## X0762.HK   29  0.73 -0.32  0.22  0.18  0.03 0.56 0.44
## X1398.HK   40  0.72  0.25 -0.01  0.02 -0.06 0.81 0.19
## X3328.HK   47  0.71  0.23 -0.02 -0.05  0.03 0.76 0.24
## X0857.HK   31  0.70 -0.04  0.26 -0.04  0.11 0.71 0.29
## X0386.HK   24  0.70 -0.23  0.34 -0.04  0.20 0.70 0.30
## X2600.HK   45  0.70  0.24 -0.08 -0.06 -0.05 0.65 0.35
## X0939.HK   33  0.69  0.16  0.03  0.08 -0.01 0.76 0.24
## X0688.HK   27  0.67  0.33 -0.26 -0.04 -0.07 0.68 0.32
## X2318.HK   43  0.65  0.31 -0.09 -0.02 -0.06 0.72 0.28
## X2628.HK   46  0.64  0.18  0.06 -0.01 -0.02 0.64 0.36
## X3988.HK   48  0.64  0.23  0.05  0.03  0.01 0.75 0.25
## X1088.HK   36  0.63  0.10  0.09  0.09  0.06 0.68 0.32
## X1109.HK   37  0.62  0.33 -0.33  0.00  0.05 0.70 0.30
## X0144.HK   17  0.61  0.13  0.00  0.00  0.11 0.59 0.41
## X0005.HK    5  0.61  0.27  0.04 -0.03 -0.01 0.68 0.32
## X0700.HK   28  0.60  0.19 -0.01  0.12 -0.31 0.56 0.44
## X1898.HK   42  0.60  0.23  0.03 -0.01 -0.01 0.62 0.38
## X1880.HK   41  0.54  0.14 -0.07  0.12 -0.09 0.45 0.55
## X0494.HK   26  0.45  0.11  0.04 -0.05 -0.08 0.25 0.75
## X0267.HK   19  0.39  0.31 -0.09  0.18  0.14 0.65 0.35
## X0011.HK    7 -0.07  0.84  0.12  0.05 -0.03 0.70 0.30
## X0001.HK    1  0.13  0.77  0.07 -0.02  0.02 0.79 0.21
## X0083.HK   15  0.19  0.70  0.02 -0.16  0.04 0.64 0.36
## X0013.HK    9  0.15  0.69  0.03  0.01  0.03 0.71 0.29
## X0016.HK   10  0.25  0.69  0.09 -0.08 -0.02 0.77 0.23
## X0017.HK   11  0.18  0.65 -0.06 -0.15  0.14 0.60 0.40
## X0012.HK    8  0.17  0.65  0.09 -0.06  0.07 0.69 0.31
## X0004.HK    4  0.29  0.63 -0.07 -0.05  0.01 0.67 0.33
## X0101.HK   16  0.22  0.61  0.06 -0.16  0.10 0.62 0.38
## X0023.HK   13  0.16  0.61  0.14  0.09 -0.16 0.63 0.37
## X0293.HK   21  0.13  0.57 -0.10  0.07  0.02 0.47 0.53
## X0388.HK   25  0.35  0.55 -0.01  0.02  0.00 0.73 0.27
## X0019.HK   12 -0.13  0.53  0.08  0.26  0.13 0.48 0.52
## X0066.HK   14 -0.03  0.53  0.32  0.07  0.09 0.58 0.42
## X2388.HK   44  0.33  0.50  0.06  0.08 -0.11 0.66 0.34
## X0291.HK   20  0.26  0.39  0.02  0.00  0.04 0.40 0.60
## X1299.HK   39  0.26  0.33  0.04  0.07  0.07 0.43 0.57
## X0002.HK    2 -0.06  0.21  0.82 -0.01 -0.17 0.69 0.31
## X0006.HK    6  0.14 -0.05  0.77 -0.24 -0.19 0.57 0.43
## X0003.HK    3 -0.30  0.32  0.62  0.13  0.21 0.60 0.40
## X0941.HK   34  0.42 -0.09  0.49  0.08  0.05 0.59 0.41
## X0322.HK   22 -0.19  0.01 -0.04  0.87  0.03 0.62 0.38
## X0151.HK   18  0.17 -0.24 -0.07  0.81  0.14 0.65 0.35
## X1044.HK   35  0.21  0.11 -0.05  0.56 -0.21 0.51 0.49
## X0836.HK   30 -0.08  0.10 -0.11  0.07  0.82 0.66 0.34
## X0330.HK   23  0.32  0.03 -0.22 -0.01  0.49 0.41 0.59
##
```

```
##                   PC1   PC4  PC2  PC3  PC5
## SS loadings    13.25 10.56 2.78 2.10 1.45
## Proportion Var  0.28  0.22 0.06 0.04 0.03
## Cumulative Var  0.28  0.50 0.55 0.60 0.63
##
##  With component correlations of
##      PC1  PC4  PC2  PC3  PC5
## PC1 1.00 0.74 0.39 0.51 0.41
## PC4 0.74 1.00 0.31 0.52 0.39
## PC2 0.39 0.31 1.00 0.22 0.31
## PC3 0.51 0.52 0.22 1.00 0.21
## PC5 0.41 0.39 0.31 0.21 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  41.24 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.49
##  0.3The number of observations was  307  with Chi Square =  1855  with prob <  7.7e-69
##  0.3
## Fit based upon off diagonal values = 1


##                PC1      PC4
## X0001.HK  0.12508  0.76665
## X0002.HK -0.05641  0.20850
## X0003.HK -0.29758  0.31623
## X0004.HK  0.28768  0.62992
## X0005.HK  0.60517  0.27332
## X0006.HK  0.13597 -0.04691
## X0011.HK -0.07443  0.83601
## X0012.HK  0.17357  0.65243
## X0013.HK  0.15110  0.69220
## X0016.HK  0.25016  0.68891
## X0017.HK  0.17583  0.65266
## X0019.HK -0.13420  0.53288
## X0023.HK  0.16045  0.61180
## X0066.HK -0.02565  0.52986
## X0083.HK  0.19406  0.69821
## X0101.HK  0.21841  0.61345
## X0144.HK  0.60866  0.13443
## X0151.HK  0.17081 -0.24120
## X0267.HK  0.39095  0.30874
## X0291.HK  0.25897  0.38812
## X0293.HK  0.12592  0.56737
## X0322.HK -0.19120  0.01268
## X0330.HK  0.31745  0.02595
## X0386.HK  0.69998 -0.22665
## X0388.HK  0.34924  0.55304
## X0494.HK  0.44501  0.11119
## X0688.HK  0.66568  0.32507
## X0700.HK  0.60307  0.19392
## X0762.HK  0.73050 -0.32302
## X0836.HK -0.08196  0.10461
## X0857.HK  0.70276 -0.04292
## X0883.HK  0.73215  0.12112
## X0939.HK  0.68815  0.16061
## X0941.HK  0.41982 -0.09194
## X1044.HK  0.21230  0.10973
```

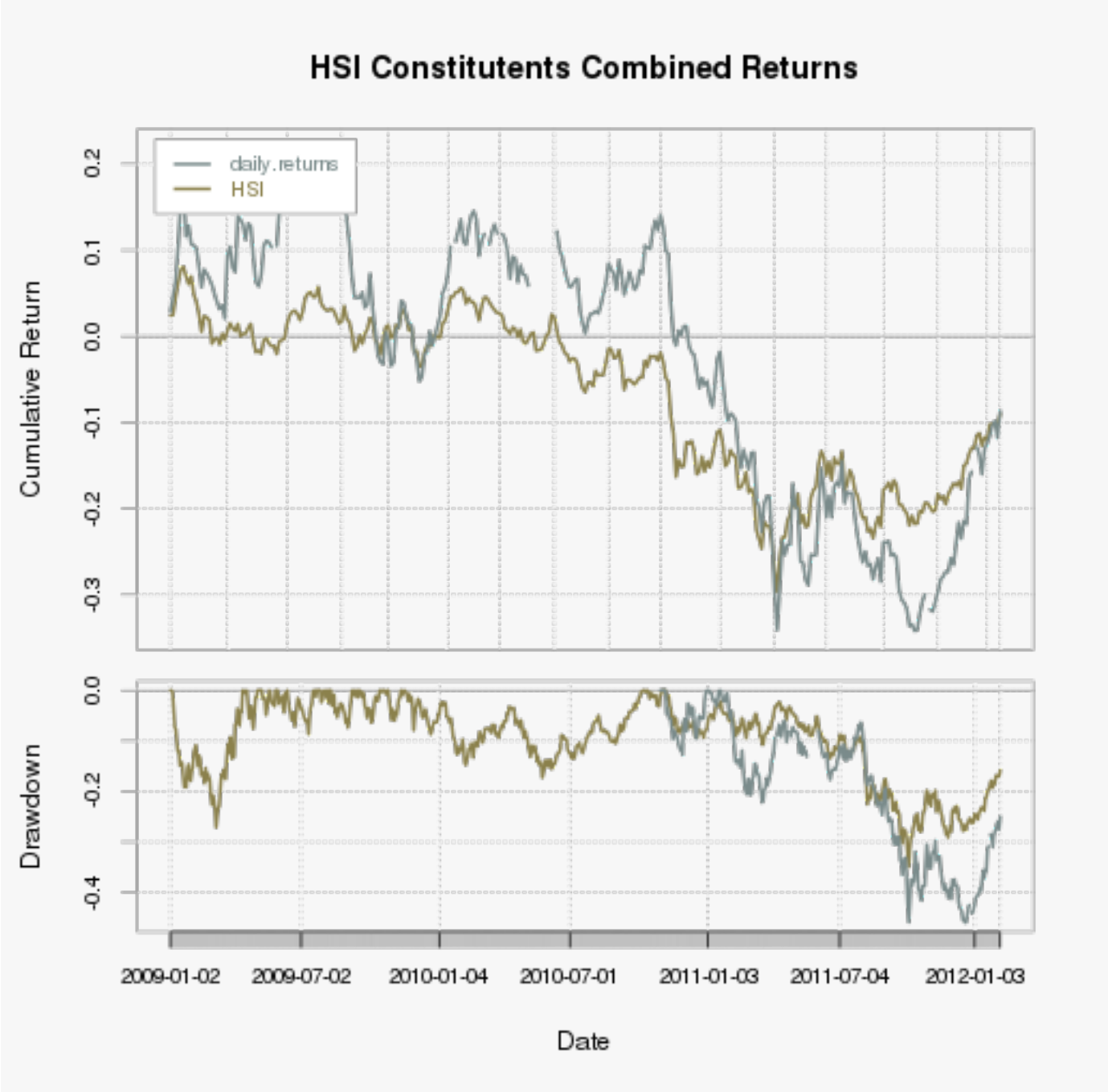
```
## X1088.HK  0.62543  0.10439
## X1109.HK  0.61656  0.32679
## X1199.HK  0.77340  0.14492
## X1299.HK  0.26485  0.33446
## X1398.HK  0.71628  0.24925
## X1880.HK  0.54093  0.14265
## X1898.HK  0.60230  0.23287
## X2318.HK  0.65071  0.31348
## X2388.HK  0.33229  0.50260
## X2600.HK  0.69557  0.23934
## X2628.HK  0.64163  0.18409
## X3328.HK  0.71086  0.22922
## X3988.HK  0.63628  0.23095
```



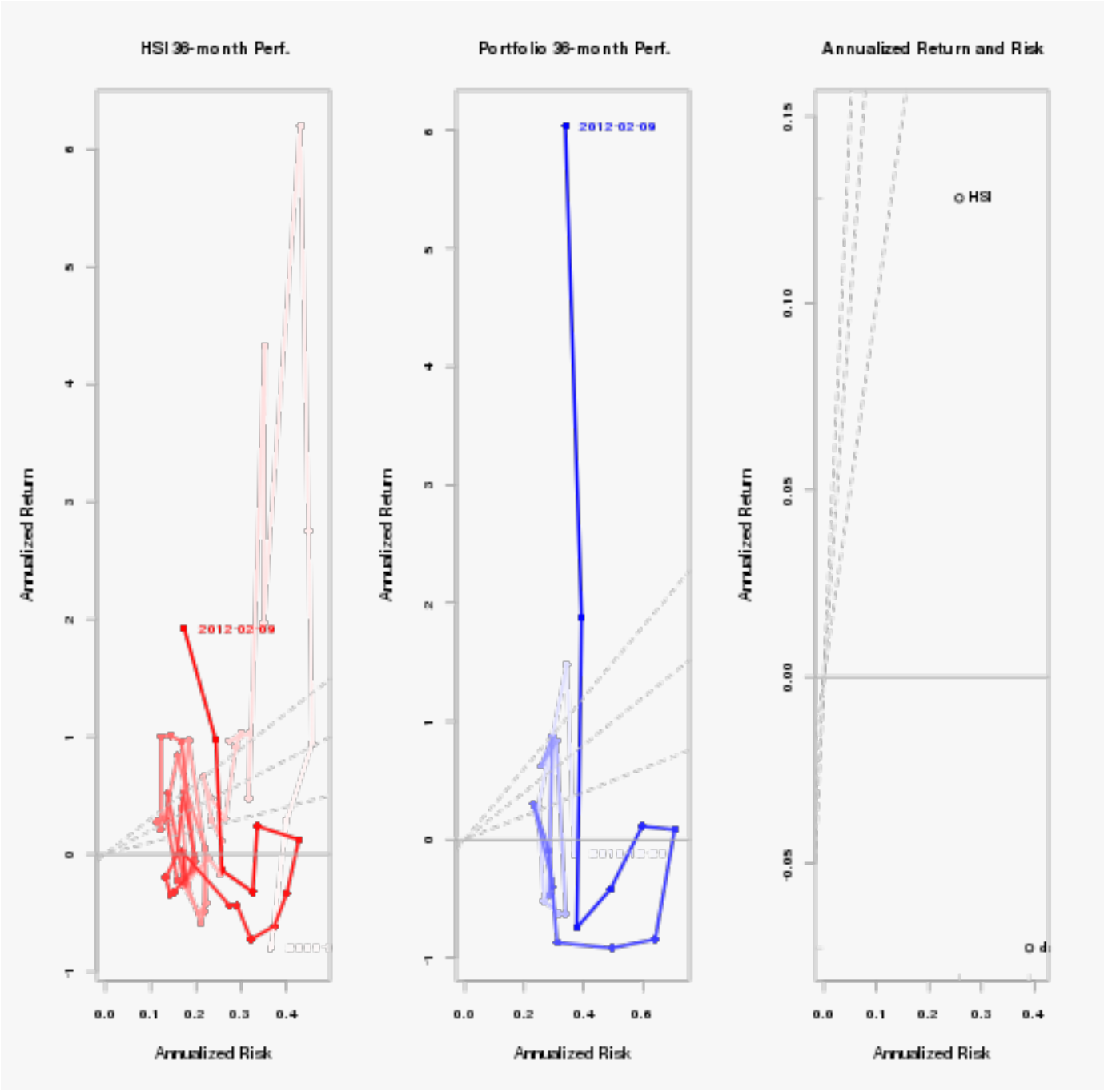
PCA is a science in itself and can not be fully covered and even less interpreted in this paper. The factors produced by principal component analysis are conceptualized as being linear combinations of the variables whereas the factors produced by common factor analysis are conceptualized as being latent 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

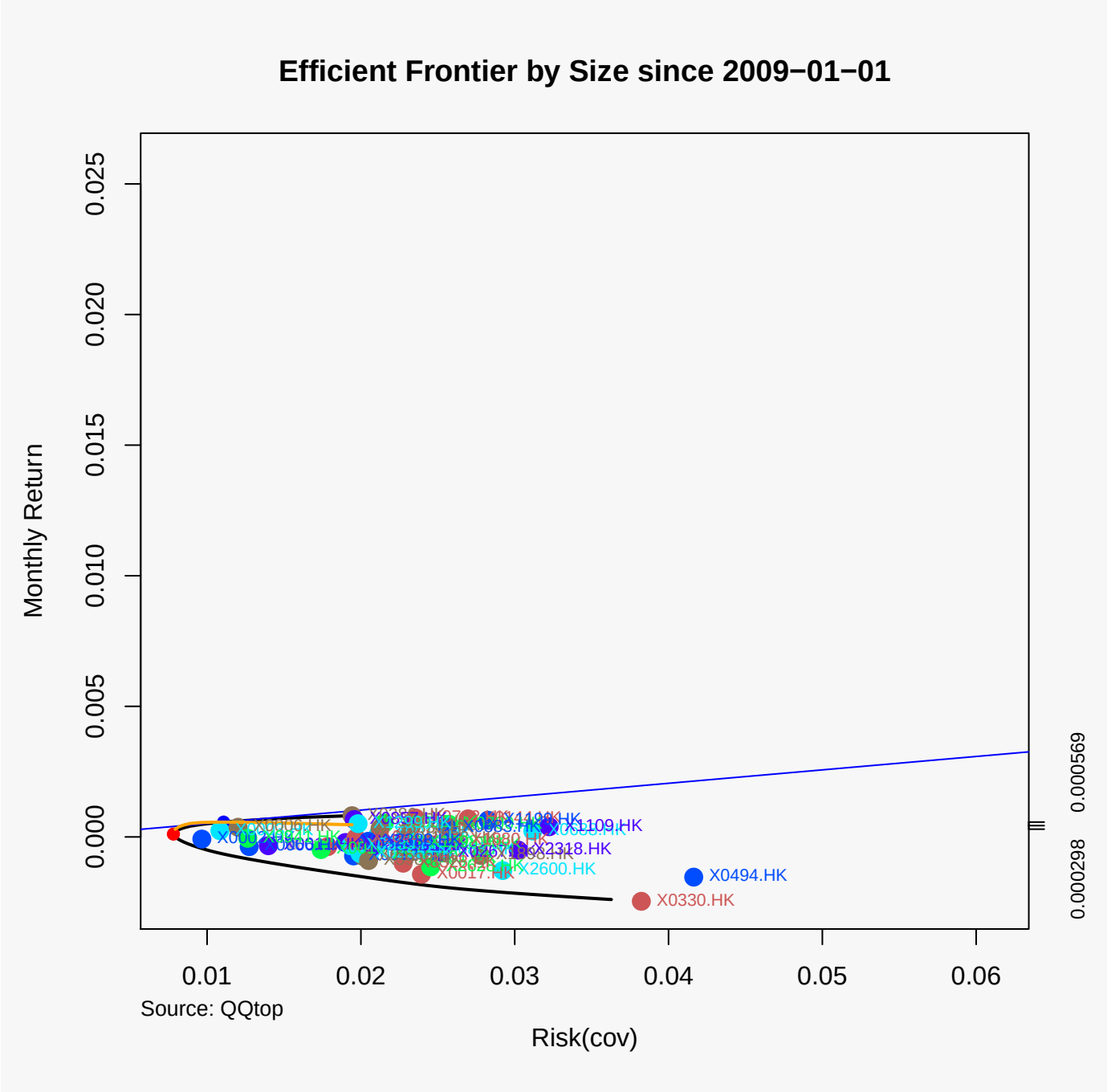
6.1 Performance Chart



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   0.0515   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.4606   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.3440   0.1630   0.0000   0.0000   0.1545   0.0441   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   0.0138   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.3738   0.0964   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.1709   0.0776   0.0000   0.0854   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0827   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   0.9294   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.3091   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0169   0.0000   0.1376   0.0000
## 37   0.0000   0.0025   0.0000   0.0000   0.0309   0.0368   0.0091   0.0000
## 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   0.0569   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0735   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0313   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0439   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   0.0410   0.0476   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   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0957   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0196   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   0.0067   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.2209   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.3508   0.1550   0.0000   0.0000   0.1426   0.0474   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   0.0035   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.3383   0.0492   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.2507   0.0749   0.0000   0.0591   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0895   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   0.9772   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.4637   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0150   0.0000   0.3062   0.0000
## 37   0.0000   0.0023   0.0000   0.0000   0.0351   0.0327   0.0140   0.0000
## 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   0.0193   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
## 13   0.0000   0.0711   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0485   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0410   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   0.0416   0.0481   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   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0000   0.0710   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0247   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  -0.0024 -0.0024  0.0363  0.0363  0.0962  0.0517
## 13 -0.0016 -0.0016  0.0209  0.0209  0.0538  0.0364
## 25 -0.0008 -0.0008  0.0122  0.0122  0.0309  0.0252
## 37  0.0000  0.0000  0.0079  0.0079  0.0182  0.0132
## 49  0.0008  0.0008  0.0194  0.0194  0.0414  0.0302
##
## Description:
##  Fri Feb 10 22:41:58 2012 by user:
```

7 HSI Components Ratios

7.1 Sharpe Ratio - Combined

```
##                                           daily.returns
## Annualized StdDev Sharpe (Rf=0%, p=95%):       -0.1857
## Annualized VaR Sharpe (Rf=0%, p=95%):          -1.9535
## Annualized ES Sharpe (Rf=0%, p=95%):           -1.5270
```

7.2 Sharpe - Distinct

```
##                                          X0001.HK X0002.HK X0003.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3358   0.4799   0.6218
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.5780   4.8346   5.9486
## Annualized ES Sharpe (Rf=0%, p=95%):       2.7825   3.4009   2.5561
##                                          X0004.HK X0005.HK X0006.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.6742  -0.0871   0.5114
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.3693  -0.9091   5.2480
## Annualized ES Sharpe (Rf=0%, p=95%):       5.7810  -0.4390   3.7460
##                                          X0011.HK X0012.HK X0013.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0345   0.3486   0.7065
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.3970   3.8563   7.7535
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.3768   3.0707   5.9875
##                                          X0016.HK X0017.HK X0019.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.5367   0.0968   0.4639
## Annualized VaR Sharpe (Rf=0%, p=95%):      5.7311   1.0186   4.6105
## Annualized ES Sharpe (Rf=0%, p=95%):       4.4691   0.7092   2.7346
##                                          X0023.HK X0066.HK X0083.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.6189   0.5853    0.360
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.6592   6.8503    3.805
## Annualized ES Sharpe (Rf=0%, p=95%):       7.4705   5.8318    2.775
##                                          X0101.HK X0144.HK X0151.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3536   0.4893   0.8553
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.8696   5.2588   9.1387
## Annualized ES Sharpe (Rf=0%, p=95%):       3.0686   4.1707   6.9294
##                                          X0267.HK X0291.HK X0293.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.3515   0.6678   0.5908
## Annualized VaR Sharpe (Rf=0%, p=95%):      4.0779   7.2307   6.1876
## Annualized ES Sharpe (Rf=0%, p=95%):       3.4638   5.7836   4.6097
##                                          X0322.HK X0330.HK X0386.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    1.035  -0.5879   0.6909
## Annualized VaR Sharpe (Rf=0%, p=95%):      14.140  -5.4357   7.1148
## Annualized ES Sharpe (Rf=0%, p=95%):       14.140  -2.9008   5.3413
##                                          X0388.HK X0494.HK X0688.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.6445   0.1615   0.2505
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.3059   2.1428   2.9106
## Annualized ES Sharpe (Rf=0%, p=95%):       5.9354   2.1428   2.5004
##                                          X0700.HK X0762.HK X0836.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):     1.33   0.3846   0.0063
## Annualized VaR Sharpe (Rf=0%, p=95%):       14.07   4.2564   0.0647
## Annualized ES Sharpe (Rf=0%, p=95%):        10.42   3.3784   0.0513
##                                          X0857.HK X0883.HK X0939.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.5205   0.7749   0.3568
## Annualized VaR Sharpe (Rf=0%, p=95%):      5.2403   8.1276   3.5385
## Annualized ES Sharpe (Rf=0%, p=95%):       3.9625   6.0780   2.4503
##                                          X0941.HK X1044.HK X1088.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0494    1.138   0.6489
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.5208   12.585   6.5691
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.4009    9.775   5.0365
##                                          X1109.HK X1199.HK X1299.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2761   0.3054   0.3483
## Annualized VaR Sharpe (Rf=0%, p=95%):      3.2462   3.3644   3.5930
## Annualized ES Sharpe (Rf=0%, p=95%):       2.7969   2.6928   2.2520
##                                          X1398.HK X1880.HK X1898.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2315    1.189   0.3421
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.6052   13.518   3.3506
```

```
## Annualized ES Sharpe (Rf=0%, p=95%):       2.1233   10.668   2.2682
##                                          X2318.HK X2388.HK X2600.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.4017   0.9659  -0.0360
## Annualized VaR Sharpe (Rf=0%, p=95%):      4.2591  11.0734  -0.3828
## Annualized ES Sharpe (Rf=0%, p=95%):       3.0478   8.9416  -0.3029
##                                          X2628.HK X3328.HK X3988.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0704   0.0595   0.4553
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.7008   0.6023   4.7869
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.4910   0.4445   3.4639
```

7.3 Information Ratio - Combined

```
## [1] "Information Ratio :  0.0843"
```

7.4 Information Ratio - Distinct

```
##                         X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK
## Information Ratio: HSI  -0.1157  -0.2535   0.0528   0.4995   -0.632
##                         X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK
## Information Ratio: HSI  -0.1369  -0.6763  -0.0279   0.4678    0.228
##                         X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK
## Information Ratio: HSI  -0.3043   0.0843   0.3484    0.013   0.0727
##                         X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK
## Information Ratio: HSI   0.0557   0.2973   0.4772   0.0732   0.4017
##                         X0293.HK X0322.HK X0330.HK X0386.HK X0388.HK
## Information Ratio: HSI   0.2628    0.599  -0.9407   0.4482   0.5062
##                         X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK
## Information Ratio: HSI  -0.0632  -0.0542    1.266    0.032  -0.3866
##                         X0857.HK X0883.HK X0939.HK X0941.HK X1044.HK
## Information Ratio: HSI   0.2498   0.7642    -0.07  -0.7408   0.7589
##                         X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## Information Ratio: HSI   0.5182   0.0216   0.0566   0.7601  -0.2408
##                         X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK
## Information Ratio: HSI    1.019    0.108   0.1616   0.7783   -0.431
##                         X2628.HK X3328.HK X3988.HK
## Information Ratio: HSI  -0.7198  -0.5529   0.1143
```

8 HSI Components Table Latest Quotes

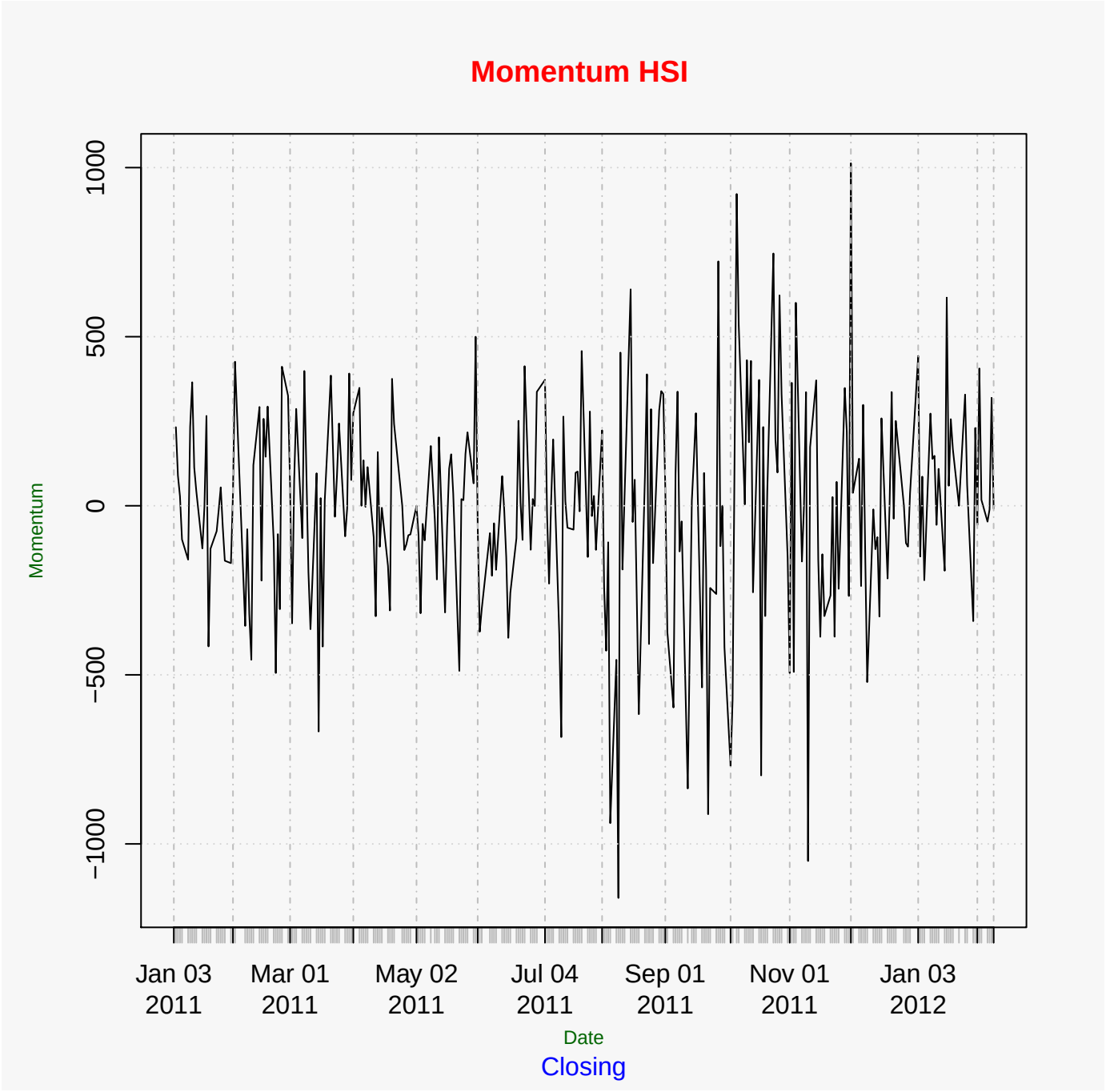
```
## [1] "Date :  2012-02-10 02:59:00"

##                    Name    Bid    Ask Change   52-week Range
## 0001.HK     CHEUNG KONG 104.70 104.80  -0.40  79.10 - 137.60
## 0002.HK    CLP HOLDINGS  64.05  64.15   0.45   59.85 - 75.20
## 0003.HK  HK & CHINA GAS  18.20  18.22  -0.04   16.70 - 19.68
## 0004.HK  WHARF HOLDINGS  46.35  46.40  -0.10   33.15 - 63.80
## 0005.HK   HSBC HOLDINGS  69.05  69.25  -0.25   56.35 - 91.90
## 0006.HK    POWER ASSETS  55.85  55.95   0.35   48.10 - 64.80
## 0011.HK  HANG SENG BANK 100.10 100.20  -1.80  84.40 - 134.40
## 0012.HK  HENDERSON LAND  42.40  42.50  -0.90   33.20 - 61.50
## 0013.HK       HUTCHISON  75.90  75.95  -0.80   53.60 - 97.45
## 0016.HK         SHK PPT 109.50 109.80  -0.40  85.45 - 147.00
## 0017.HK   NEW WORLD DEV   9.17   9.18  -0.09    7.00 - 17.98
## 0019.HK SWIRE PACIFIC A  85.45  85.65  -0.50  79.30 - 137.20
## 0023.HK  BANK OF E ASIA  30.30  30.40  -0.50   21.85 - 36.60
## 0066.HK MTR CORPORATION  26.25  26.30  -0.20   22.45 - 31.55
## 0083.HK       SINO LAND  12.58  12.60  -0.32    9.33 - 18.90
## 0101.HK   HANG LUNG PPT  27.90  28.00  -0.15   20.85 - 40.50
## 0144.HK  CHINA MER HOLD  28.10  28.20  -0.50   19.00 - 37.60
## 0151.HK WANT WANT CHINA   7.11   7.14  -0.10     5.68 - 8.30
## 0267.HK   CITIC PACIFIC  15.48  15.54  -0.36   10.26 - 24.60
## 0291.HK CHINA RESOURCES  27.60  27.75  -0.10   24.10 - 35.50
## 0293.HK  CATHAY PAC AIR  15.70  15.74  -0.16   11.80 - 24.10
## 0322.HK          TINGYI  22.40  22.55   0.00   17.32 - 26.00
## 0330.HK ESPRIT HOLDINGS  14.30  14.34  -0.14    7.55 - 45.65
## 0386.HK    SINOPEC CORP   9.19   9.20  -0.12     6.22 - 8.90
## 0388.HK            HKEX 141.40 141.70  -2.60  99.15 - 198.60
## 0494.HK       LI & FUNG  17.82  17.92  -0.34   10.82 - 51.95
## 0688.HK  CHINA OVERSEAS  15.22  15.32  -0.18    9.99 - 17.86
## 0700.HK         TENCENT 185.90 186.00  -3.60 139.90 - 230.80
## 0762.HK    CHINA UNICOM  14.14  14.16  -0.18   10.24 - 17.68
## 0836.HK CHINA RES POWER  15.22  15.26   0.04   10.82 - 16.44
## 0857.HK      PETROCHINA  11.56  11.58  -0.22    8.59 - 12.50
## 0883.HK           CNOOC  17.24  17.26  -0.18   11.20 - 21.30
## 0939.HK             CCB   6.22   6.23  -0.13     4.41 - 8.47
## 0941.HK    CHINA MOBILE  78.75  78.80   0.75   68.05 - 83.80
## 1044.HK    HENGAN INT'L  70.15  70.20   0.35   54.10 - 75.40
## 1088.HK   CHINA SHENHUA  34.60  34.75  -0.20   27.10 - 40.20
## 1109.HK  CHINA RES LAND  14.76  14.84   0.08    7.28 - 17.24
## 1199.HK   COSCO PACIFIC  12.02  12.10  -0.30    7.52 - 17.16
## 1299.HK             AIA  26.20  26.30   0.05   19.84 - 29.90
## 1398.HK            ICBC   5.32   5.33  -0.13     3.46 - 6.90
## 1880.HK     BELLE INT'L  12.70  12.72  -0.46   11.56 - 17.54
## 1898.HK      CHINA COAL  10.06  10.10  -0.30    6.59 - 15.08
## 2318.HK         PING AN  63.80  63.85  -1.30   37.35 - 96.25
## 2388.HK   BOC HONG KONG  21.50  21.60  -0.10   14.24 - 29.40
## 2600.HK          CHALCO   4.16   4.17  -0.13     3.20 - 8.30
## 2628.HK      CHINA LIFE  22.20  22.25  -0.65   17.04 - 36.90
## 3328.HK        BANKCOMM   5.98   5.99  -0.32     4.15 - 9.53
## 3988.HK   BANK OF CHINA   3.26   3.27  -0.09     2.20 - 5.02
```

9 Hang Seng Index

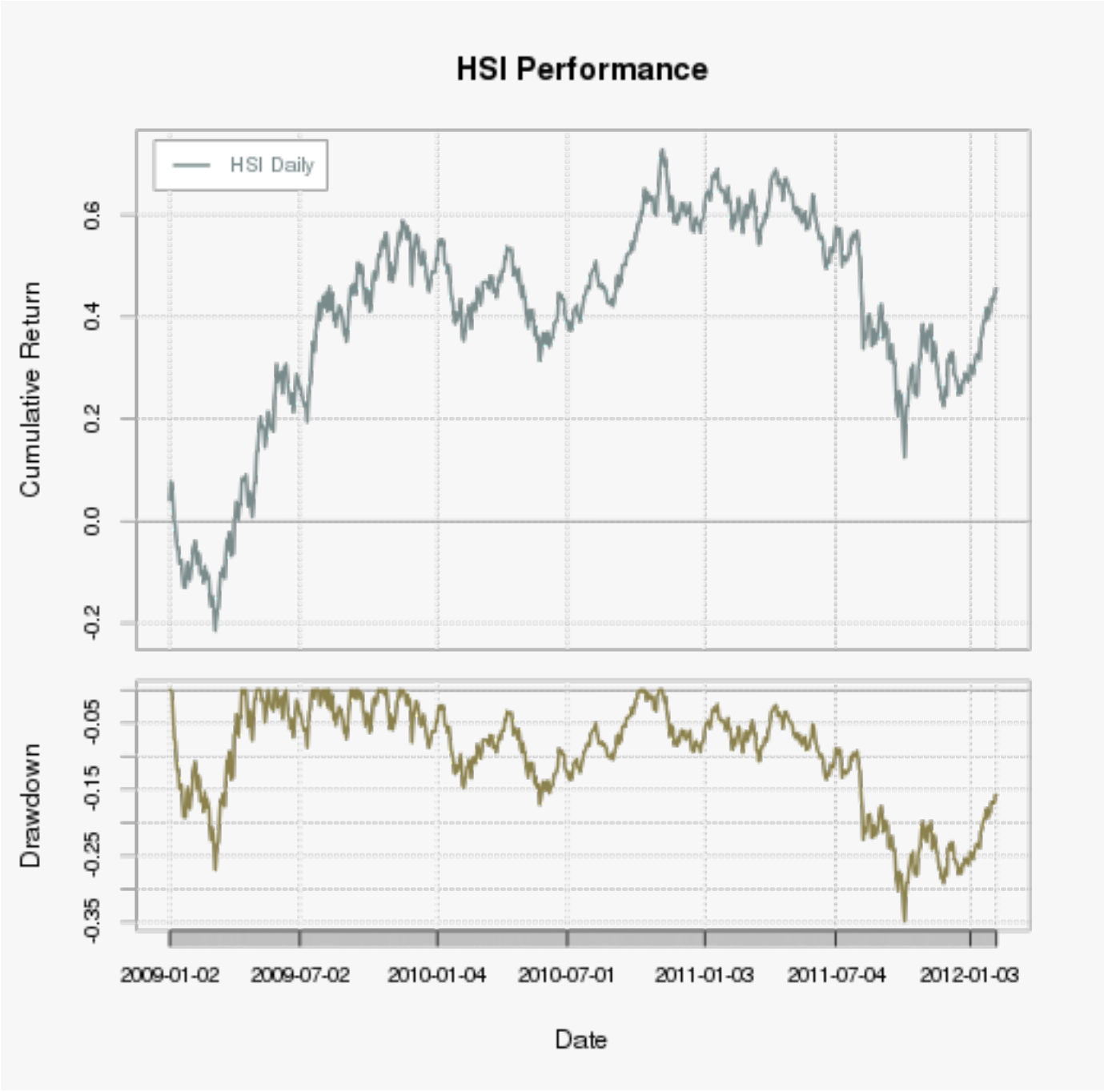
Latest Hang Seng Index

	Trade Time	Name	Last	Change	Days Range	52−week Range
^HSI	2012−02−10 03:01:00	HANG SENG INDEX	20784	−226.2	20703.789 − 21002.33	16170.30 − 24468.60

9.1 Hang Seng Index - Momentum



9.2 HSI Performance



9.3 HSI Ratios

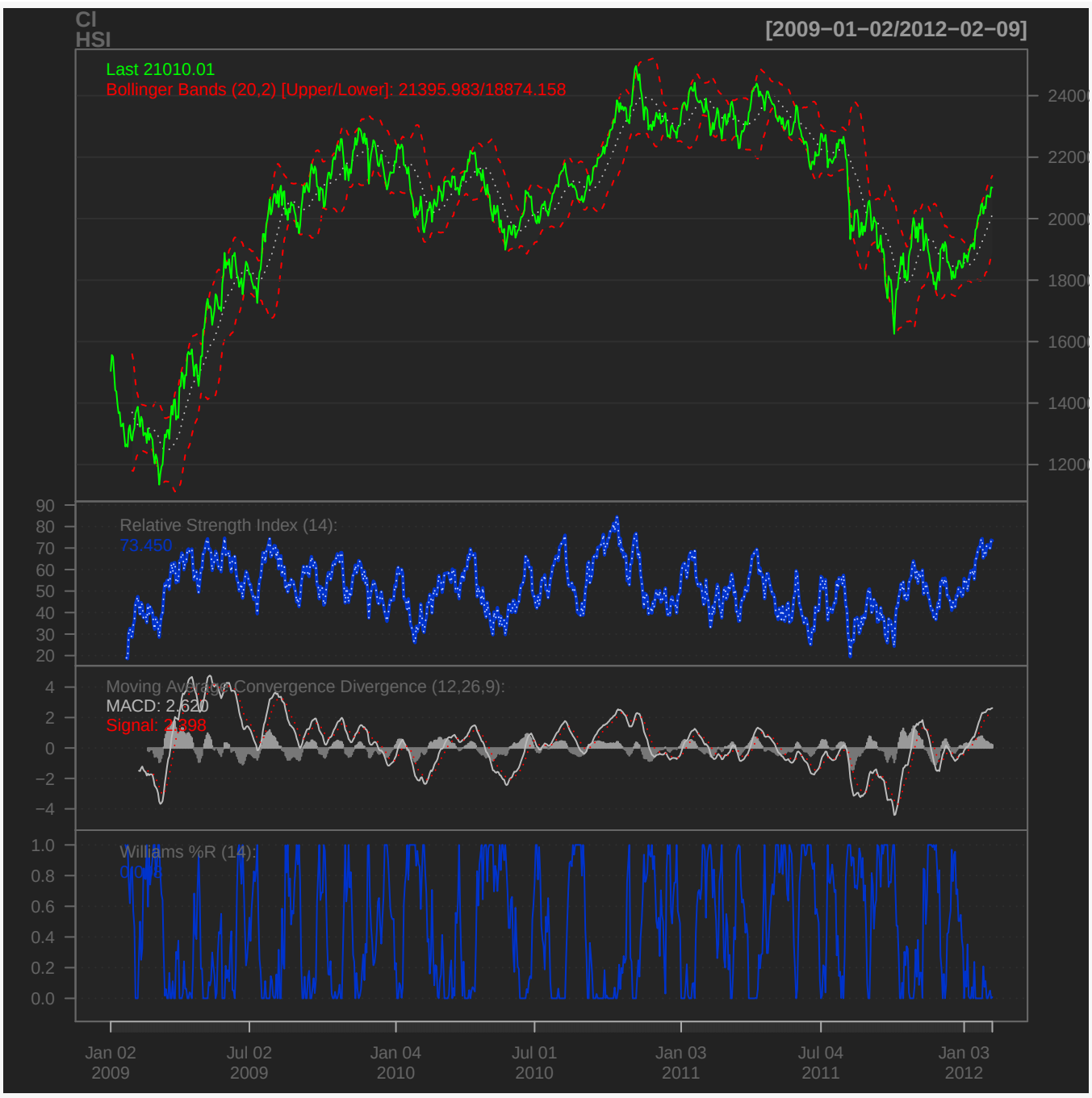
```
##               RSI
## 2012-01-27 74.42
## 2012-01-30 65.34
## 2012-01-31 68.16
## 2012-02-01 66.71
## 2012-02-02 71.38
## 2012-02-03 71.56
## 2012-02-06 70.25
## 2012-02-07 69.93
## 2012-02-08 73.71
## 2012-02-09 73.45
```

```
##              macd signal
## 2012-01-27 2.312  1.541
## 2012-01-30 2.296  1.692
## 2012-01-31 2.349  1.823
## 2012-02-01 2.339  1.927
## 2012-02-02 2.465  2.034
## 2012-02-03 2.540  2.135
## 2012-02-06 2.550  2.218
## 2012-02-07 2.523  2.279
## 2012-02-08 2.597  2.343
## 2012-02-09 2.620  2.398
```

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

```
##                dn  mavg    up   pctB
## 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
## 2012-02-06 18451 19822 21192 0.8240
## 2012-02-07 18629 19927 21226 0.7973
## 2012-02-08 18749 20035 21320 0.8826
## 2012-02-09 18874 20135 21396 0.8469
```

```
##             WPR %
## 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
## 2012-02-06  2.70
## 2012-02-07  5.12
## 2012-02-08  0.00
## 2012-02-09  0.79
```


CI
HSI
[2009−01−02/2012−02−09]
Last 21010.01
Bollinger Bands (20,2) [Upper/Lower]: 21395.983/18874.158
Relative Strength Index (14):
73.450
Moving Average Convergence Divergence (12,26,9):
MACD: 2.620
Signal: 2.398
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%):    0.4969      0.4626
## Annualized VaR Sharpe (Rf=0%, p=95%):       5.1054      1.1206
## Annualized ES Sharpe (Rf=0%, p=95%):        3.7621      0.8781

##          HSI-Daily HSI-Monthly
## Skewness    0.1138      0.1033

##          HSI-Daily HSI-Monthly
## Kurtosis     1.404    -0.05692
```

```
##       Index              HSI Daily
##  Min.   :2009-01-02   Min.   :-0.056605
##  1st Qu.:2009-10-12   1st Qu.:-0.008056
##  Median :2010-07-22   Median : 0.000295
##  Mean   :2010-07-21   Mean   : 0.000610
##  3rd Qu.:2011-04-28   3rd Qu.: 0.010223
##  Max.   :2012-02-09   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   : 0.01115
##  3rd Qu.:2011-05-23   3rd Qu.: 0.03680
##  Max.   :2012-02-09   Max.   : 0.17074
```

10 Dataset First and Last Rows Info

```
##            X0001.HK.Close
## 2009-01-02           76.9
## 2012-02-09          105.2
##            X0002.HK.Close
## 2009-01-02          52.40
## 2012-02-09          63.55
##            X0003.HK.Close
## 2009-01-02          12.08
## 2012-02-09          18.24
##            X0004.HK.Close
## 2009-01-02          22.00
## 2012-02-09          46.45
##            X0005.HK.Close
## 2009-01-02           77.0
## 2012-02-09           69.3
##            X0006.HK.Close
## 2009-01-02          42.75
## 2012-02-09          55.75
##            X0011.HK.Close
## 2009-01-02          104.7
## 2012-02-09          102.0
##            X0012.HK.Close
## 2009-01-02          30.35
## 2012-02-09          43.35
##            X0013.HK.Close
## 2009-01-02          39.85
## 2012-02-09          76.85
##            X0016.HK.Close
## 2009-01-02           67.3
## 2012-02-09          110.1
##            X0017.HK.Close
## 2009-01-02           8.18
## 2012-02-09           9.23
##            X0019.HK.Close
## 2009-01-02          55.75
## 2012-02-09          86.05
##            X0023.HK.Close
## 2009-01-02          16.68
## 2012-02-09          30.80
##            X0066.HK.Close
## 2009-01-02          18.08
## 2012-02-09          26.50
##            X0083.HK.Close
## 2009-01-02           8.36
## 2012-02-09          12.88
##            X0101.HK.Close
## 2009-01-02          18.36
## 2012-02-09          27.95
##            X0144.HK.Close
## 2009-01-02           15.4
## 2012-02-09           28.8
##            X0151.HK.Close
## 2009-01-02           3.17
## 2012-02-09           7.21
##            X0267.HK.Close
```

```
## 2009-01-02          10.20
## 2012-02-09          15.86
##            X0291.HK.Close
## 2009-01-02          14.00
## 2012-02-09          27.75
##            X0293.HK.Close
## 2009-01-02           8.91
## 2012-02-09          15.90
##            X0322.HK.Close
## 2009-01-02           8.98
## 2012-02-09          22.50
##            X0330.HK.Close
## 2009-01-02           44.8
## 2012-02-09           14.4
##            X0386.HK.Close
## 2009-01-02           4.96
## 2012-02-09           9.33
##            X0388.HK.Close
## 2009-01-02           76.6
## 2012-02-09          144.7
##            X0494.HK.Close
## 2009-01-02          14.04
## 2012-02-09          18.24
##            X0688.HK.Close
## 2009-01-02          11.22
## 2012-02-09          15.54
##            X0700.HK.Close
## 2009-01-01           50.0
## 2012-02-09          189.6
##            X0762.HK.Close
## 2009-01-01           9.63
## 2012-02-09          14.40
##            X0836.HK.Close
## 2009-01-02          15.12
## 2012-02-09          15.22
##            X0857.HK.Close
## 2009-01-02           7.20
## 2012-02-09          11.78
##            X0883.HK.Close
## 2009-01-02           7.59
## 2012-02-09          17.40
##            X0939.HK.Close
## 2009-01-02           4.52
## 2012-02-09           6.35
##            X0941.HK.Close
## 2009-01-02           81.2
## 2012-02-09           78.1
##            X1044.HK.Close
## 2009-01-01          24.90
## 2012-02-09          69.95
##            X1088.HK.Close
## 2009-01-02           17.4
## 2012-02-09           34.8
##            X1109.HK.Close
## 2009-01-02           9.90
## 2012-02-09          14.74
##            X1199.HK.Close
```

```
## 2009-01-02           8.07
## 2012-02-09          12.40
##            X1299.HK.Close
## 2010-10-29           23.1
## 2012-02-09           26.3
##            X1398.HK.Close
## 2009-01-02           4.30
## 2012-02-09           5.47
##            X1880.HK.Close
## 2009-01-02           3.50
## 2012-02-09          13.14
##            X1898.HK.Close
## 2009-01-02           6.55
## 2012-02-09          10.40
##            X2318.HK.Close
## 2009-01-02           39.6
## 2012-02-09           65.0
##            X2388.HK.Close
## 2009-01-02           9.06
## 2012-02-09          21.70
##            X2600.HK.Close
## 2009-01-02           4.55
## 2012-02-09           4.30
##            X2628.HK.Close
## 2009-01-02          24.75
## 2012-02-09          22.90
##            X3328.HK.Close
## 2009-01-02           5.91
## 2012-02-09           6.31
##            X3988.HK.Close
## 2009-01-02           2.17
## 2012-02-09           3.36
```

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 !