CAPM and other Statistics for HSI Components Version 1.1

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Contents

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1 Introduction

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

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

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

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

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

[1] Wikipedia

2 CAPM Analysis

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

2.1 HSI Components CAPM with HSI as benchmark

CAPM - Combined

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

##                      HSI Components to HSI
## Alpha                                0.0002
## Beta                                 1.1735
## Beta+                                1.2801
## Beta-                                1.1554
## R-squared                            0.5566
## Annualized Alpha                     0.0437
## Correlation                          0.7461
## Correlation p-value                  0.0000
## Tracking Error                       0.2625
## Active Premium                      -0.0232
## Information Ratio                   -0.0885
## Treynor Ratio                       -0.1625
```

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

CAPM - Distinct for each stock

```
##                     0001.HK 0002.HK 0003.HK 0004.HK 0005.HK 0006.HK
## Alpha                 0.000   0.000   0.000   0.001  -0.001   0.000
## Beta                  0.988   0.149   0.381   1.107   1.122   0.118
## Beta+                 0.954   0.037   0.281   1.115   1.217   0.060
## Beta-                 0.975   0.187   0.413   1.090   1.310   0.130
## R-squared             0.640   0.082   0.181   0.494   0.560   0.030
## Annualized Alpha     -0.002   0.059   0.117   0.150  -0.139   0.096
## Correlation           0.800   0.287   0.425   0.703   0.748   0.174
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.193   0.257   0.266   0.294   0.262   0.289
## Active Premium       -0.023  -0.030   0.042   0.120  -0.180  -0.004
## Information Ratio    -0.118  -0.118   0.156   0.410  -0.686  -0.015
## Treynor Ratio         0.078   0.465   0.371   0.199  -0.071   0.808
##                     0011.HK 0012.HK 0013.HK 0016.HK 0017.HK 0019.HK
## Alpha                 0.000   0.000   0.000   0.000   0.000   0.000
## Beta                  0.640   1.022   0.948   1.005   1.129   0.783
## Beta+                 0.715   1.056   0.873   0.977   1.055   0.848
## Beta-                 0.672   0.996   0.990   0.981   1.146   0.727
## R-squared             0.454   0.559   0.526   0.644   0.502   0.387
## Annualized Alpha     -0.087   0.028   0.121   0.059  -0.097   0.068
## Correlation           0.673   0.747   0.725   0.802   0.708   0.622
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.206   0.237   0.235   0.195   0.296   0.263
## Active Premium       -0.138   0.001   0.096   0.044  -0.141   0.020
## Information Ratio    -0.668   0.006   0.409   0.224  -0.477   0.075
## Treynor Ratio        -0.059   0.099   0.207   0.143  -0.037   0.153
##                     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                  0.942   0.512   1.165   1.094   1.316   0.428
## Beta+                 1.032   0.434   1.142   1.248   1.274   0.194
## Beta-                 0.935   0.499   1.214   0.977   1.210   0.517
## R-squared             0.466   0.339   0.517   0.471   0.544   0.096
## Annualized Alpha      0.137   0.074   0.047   0.037   0.104   0.359
## Correlation           0.683   0.582   0.719   0.686   0.737   0.310
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.264   0.226   0.297   0.304   0.326   0.374
## Active Premium        0.105   0.018   0.013  -0.004   0.075   0.247
## Information Ratio     0.397   0.081   0.045  -0.013   0.231   0.660
## Treynor Ratio         0.217   0.231   0.097   0.088   0.133   0.810
##                     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   0.888   0.771   0.349   0.941   0.954
## Beta+                 1.037   0.782   0.733   0.257   0.738   0.797
## Beta-                 0.976   0.901   0.753   0.383   1.100   1.004
## R-squared             0.401   0.375   0.322   0.072   0.216   0.557
## Annualized Alpha      0.063   0.203   0.119   0.396  -0.348   0.136
## Correlation           0.634   0.612   0.567   0.267   0.464   0.746
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.345   0.301   0.298   0.370   0.469   0.222
## Active Premium        0.009   0.156   0.062   0.279  -0.462   0.116
## Information Ratio     0.025   0.520   0.206   0.756  -0.985   0.522
## Treynor Ratio         0.100   0.288   0.209   1.086  -0.385   0.226
##                     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                  1.158   0.968   1.183   0.934   0.699   0.558
```

```
## Beta+                 1.245   0.965   1.345   0.966   0.529   0.415
## Beta-                 1.103   0.861   0.926   0.784   0.650   0.662
## R-squared             0.704   0.202   0.471   0.354   0.254   0.180
## Annualized Alpha      0.076   0.116   0.015   0.450   0.133   0.000
## Correlation           0.839   0.450   0.686   0.595   0.504   0.425
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.200   0.504   0.330   0.329   0.322   0.331
## Active Premium        0.072  -0.047  -0.030   0.405   0.062  -0.086
## Information Ratio     0.362  -0.093  -0.090   1.229   0.194  -0.261
## Treynor Ratio         0.149   0.046   0.059   0.534   0.230   0.024
##                     0857.HK 0883.HK 0939.HK 0941.HK 1044.HK 1088.HK
## Alpha                 0.000   0.001   0.000   0.000   0.001   0.001
## Beta                  1.102   1.284   1.061   0.710   0.466   1.219
## Beta+                 1.013   1.189   1.002   0.708   0.363   1.140
## Beta-                 1.096   1.246   1.035   0.735   0.414   1.142
## R-squared             0.725   0.687   0.699   0.520   0.119   0.649
## Annualized Alpha      0.057   0.157  -0.002  -0.077   0.418   0.156
## Correlation           0.851   0.829   0.836   0.721   0.345   0.806
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.179   0.238   0.183   0.194   0.358   0.241
## Active Premium        0.051   0.159  -0.017  -0.121   0.317   0.152
## Information Ratio     0.285   0.666  -0.091  -0.624   0.887   0.631
## Treynor Ratio         0.137   0.201   0.078  -0.030   0.883   0.206
##                     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                  1.160   1.337   0.826   1.125   0.821   1.493
## Beta+                 1.224   1.347   0.831   1.090   0.768   1.385
## Beta-                 0.778   1.427   1.052   1.055   0.899   1.439
## R-squared             0.359   0.493   0.410   0.686   0.220   0.662
## Annualized Alpha      0.079   0.038   0.203  -0.022   0.500   0.050
## Correlation           0.599   0.702   0.641   0.828   0.469   0.814
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.407   0.364   0.246   0.201   0.406   0.306
## Active Premium        0.005  -0.008   0.176  -0.038   0.404   0.034
## Information Ratio     0.012  -0.023   0.714  -0.187   0.995   0.113
## Treynor Ratio         0.090   0.068   0.035   0.055   0.613   0.090
##                     2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## Alpha                 0.000   0.001  -0.001  -0.001   0.000   0.000
## Beta                  1.318   0.878   1.533   1.083   1.194   1.033
## Beta+                 1.361   0.887   1.565   1.050   1.162   0.952
## Beta-                 1.226   0.846   1.395   1.066   1.215   1.009
## R-squared             0.621   0.441   0.620   0.637   0.728   0.630
## Annualized Alpha      0.020   0.229  -0.131  -0.138  -0.089   0.053
## Correlation           0.788   0.664   0.787   0.798   0.853   0.794
## Correlation p-value   0.000   0.000   0.000   0.000   0.000   0.000
## Tracking Error        0.281   0.260   0.343   0.214   0.197   0.207
## Active Premium        0.000   0.198  -0.168  -0.168  -0.106   0.036
## Information Ratio    -0.001   0.762  -0.491  -0.786  -0.535   0.176
## Treynor Ratio         0.076   0.339  -0.045  -0.063  -0.005   0.132
```

3 HSI Components Risk

3.1 Correlation

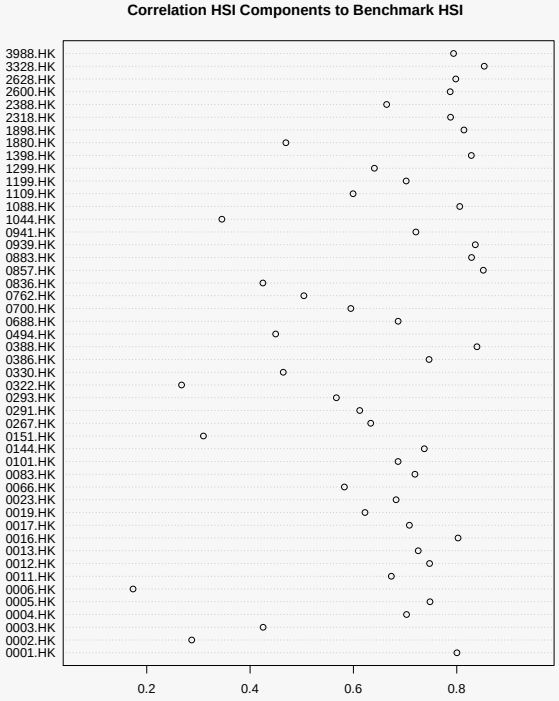
Correlation Combined

```
##                       Correlation p-value Lower CI Upper CI
## HSI Components to HSI      0.7461       0   0.6707   0.8062
```

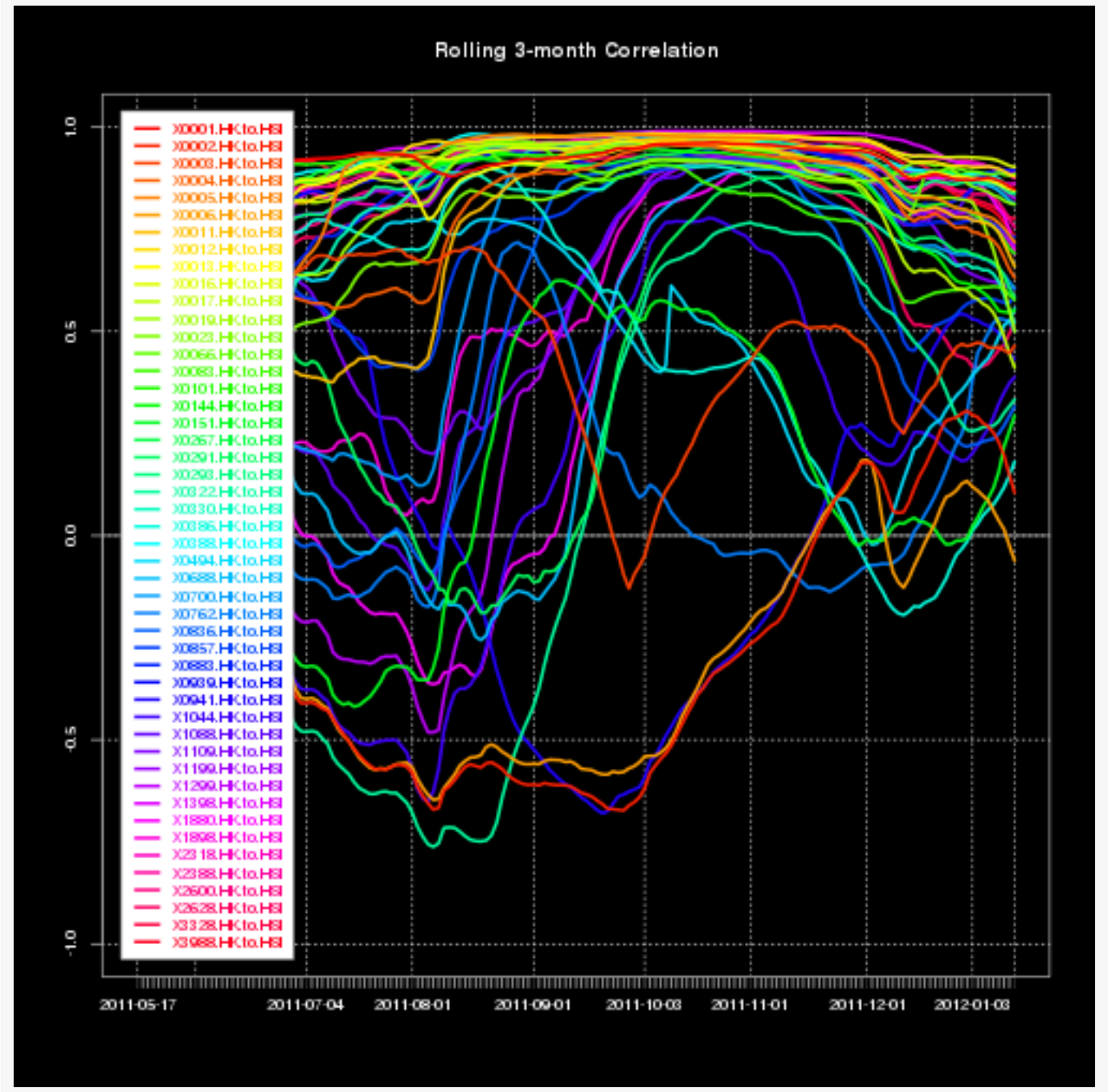
Correlation - Distinct

```
##         Correlation p-value Lower CI Upper CI
## 0001.HK      0.8003       0   0.7639   0.8317
## 0002.HK      0.2870       0   0.1986   0.3707
## 0003.HK      0.4252       0   0.3452   0.4990
## 0004.HK      0.7028       0   0.6521   0.7473
## 0005.HK      0.7482       0   0.7039   0.7868
## 0006.HK      0.1735       0   0.0811   0.2629
## 0011.HK      0.6734       0   0.6188   0.7216
## 0012.HK      0.7474       0   0.7030   0.7861
## 0013.HK      0.7254       0   0.6777   0.7669
## 0016.HK      0.8025       0   0.7664   0.8335
## 0017.HK      0.7083       0   0.6583   0.7521
## 0019.HK      0.6224       0   0.5614   0.6766
## 0023.HK      0.6826       0   0.6291   0.7296
## 0066.HK      0.5825       0   0.5170   0.6412
## 0083.HK      0.7190       0   0.6704   0.7614
## 0101.HK      0.6864       0   0.6335   0.7330
## 0144.HK      0.7372       0   0.6913   0.7773
## 0151.HK      0.3097       0   0.2224   0.3920
## 0267.HK      0.6335       0   0.5739   0.6865
## 0291.HK      0.6122       0   0.5500   0.6676
## 0293.HK      0.5670       0   0.4998   0.6274
## 0322.HK      0.2674       0   0.1782   0.3523
## 0330.HK      0.4642       0   0.3873   0.5347
## 0386.HK      0.7464       0   0.7018   0.7852
## 0388.HK      0.8391       0   0.8090   0.8648
## 0494.HK      0.4495       0   0.3708   0.5217
## 0688.HK      0.6865       0   0.6336   0.7331
## 0700.HK      0.5950       0   0.5310   0.6523
## 0762.HK      0.5041       0   0.4309   0.5708
## 0836.HK      0.4248       0   0.3448   0.4987
## 0857.HK      0.8514       0   0.8234   0.8753
## 0883.HK      0.8286       0   0.7967   0.8558
## 0939.HK      0.8359       0   0.8053   0.8621
## 0941.HK      0.7209       0   0.6726   0.7630
## 1044.HK      0.3454       0   0.2603   0.4251
## 1088.HK      0.8058       0   0.7702   0.8363
## 1109.HK      0.5993       0   0.5356   0.6561
## 1199.HK      0.7021       0   0.6512   0.7467
## 1299.HK      0.6406       0   0.5441   0.7204
## 1398.HK      0.8282       0   0.7963   0.8555
## 1880.HK      0.4693       0   0.3929   0.5393
## 1898.HK      0.8139       0   0.7797   0.8433
## 2318.HK      0.7880       0   0.7497   0.8211
## 2388.HK      0.6643       0   0.6085   0.7136
## 2600.HK      0.7873       0   0.7489   0.8205
## 2628.HK      0.7981       0   0.7614   0.8298
```

```
## 3328.HK      0.8532       0   0.8255   0.8768
## 3988.HK      0.7938       0   0.7563   0.8260
```



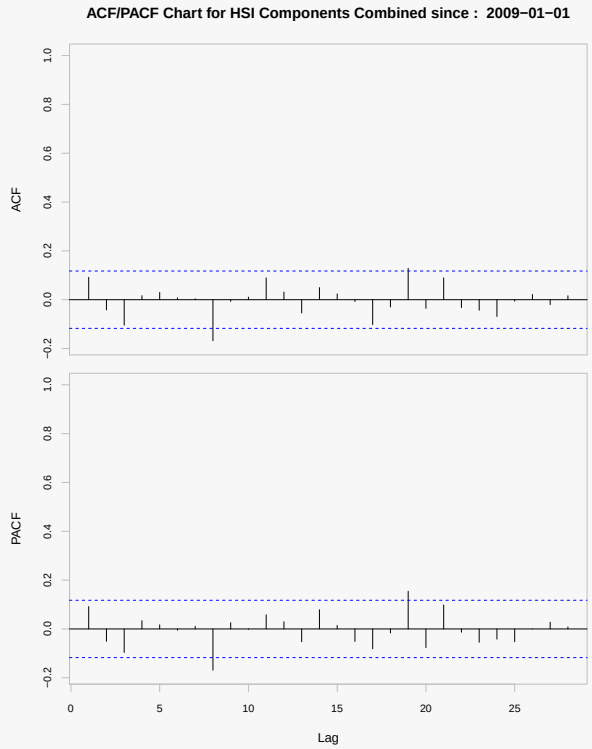
3 Month Rolling Correlation



3.2 Autocorrelation Coefficients - Combined

Autocorrelation Combined

```
##                  rho1    rho2    rho3   rho4   rho5   rho6 Q(6) p-value
## daily.returns 0.0917 -0.0419 -0.1042 0.0165 0.0295 0.0077       0.3654
```



3.3 Downside Risk - Combined

Downside Risk Combined

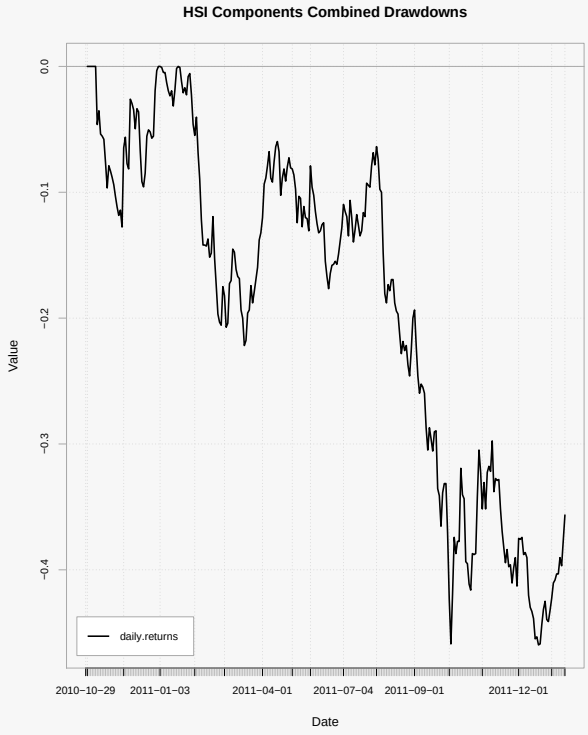
```
##                                HSI Components dailyReturn
## Semi Deviation                                      0.0226
## Gain Deviation                                      0.0182
## Loss Deviation                                      0.0154
## Downside Deviation (MAR=210%)                       0.0263
## Downside Deviation (Rf=0%)                          0.0230
## Downside Deviation (0%)                             0.0230
## Maximum Drawdown                                    0.4597
## Historical VaR (95%)                               -0.0369
## Historical ES (95%)                                -0.0520
## Modified VaR (95%)                                 -0.0375
## Modified ES (95%)                                  -0.0481
```

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    235       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%)          0.02298
```

3.6 Autocorrelation Coefficients - Distinct

```
##             rho1    rho2    rho3    rho4    rho5    rho6 Q(6) p-value
## X0001.HK  0.0508 -0.0684  0.0211 -0.0334  0.0071  0.0080       0.3425
## X0002.HK -0.1256 -0.0503 -0.0177  0.0241  0.0133 -0.0346       0.0161
## X0003.HK -0.0972 -0.0140 -0.0233  0.0502  0.0174  0.0263       0.1094
## X0004.HK  0.0119 -0.0395 -0.0299 -0.0306  0.0843 -0.0408       0.1550
## X0005.HK -0.0249 -0.0272  0.0605  0.0320 -0.0485  0.0284       0.3216
## X0006.HK -0.0946 -0.0699  0.0132 -0.0193  0.0046 -0.0750       0.0187
## X0011.HK  0.1135  0.0118 -0.0192  0.0038 -0.0464 -0.0829       0.0092
## X0012.HK  0.0684 -0.0266 -0.0487 -0.0084  0.0464  0.0057       0.2694
## X0013.HK  0.0006  0.0304  0.0094 -0.0118  0.0237 -0.0284       0.9274
## X0016.HK  0.0420 -0.0592  0.0237 -0.0084  0.0407  0.0175       0.4270
## X0017.HK  0.0746  0.0129  0.0084  0.0200  0.0440 -0.0278       0.3436
## X0019.HK  0.0502  0.0448 -0.0272 -0.1086 -0.0083  0.0239       0.0364
## X0023.HK  0.0865 -0.0088 -0.0089  0.0002 -0.0450 -0.0379       0.2087
## X0066.HK -0.0753  0.0022  0.0553 -0.0249 -0.0099 -0.0170       0.2872
## X0083.HK  0.1005 -0.0634 -0.0384  0.0027  0.0465  0.0053       0.0359
## X0101.HK -0.0647 -0.0342  0.0200 -0.0471 -0.0597  0.0188       0.1721
## X0144.HK  0.0655 -0.0103  0.0031 -0.0510 -0.1081 -0.0006       0.0273
## X0151.HK -0.0156 -0.0297 -0.0868 -0.0965  0.0094 -0.0046       0.0328
## X0267.HK  0.1238  0.0370 -0.0542 -0.0230  0.0414  0.0427       0.0063
## X0291.HK -0.0362 -0.0193  0.0086 -0.0442  0.0095 -0.0024       0.8227
## X0293.HK  0.0253 -0.0479 -0.0715 -0.0551  0.0738  0.0680       0.0133
## X0322.HK -0.0113  0.0340 -0.0893 -0.0012 -0.0195 -0.0233       0.2590
## X0330.HK  0.0442  0.1208 -0.0160  0.0416 -0.0108 -0.0182       0.0256
## X0386.HK -0.0191 -0.0232 -0.0384 -0.0173 -0.0105  0.0340       0.8089
## X0388.HK  0.1014 -0.0120  0.0331 -0.0158  0.0031 -0.0136       0.1701
## X0494.HK -0.0149 -0.0301 -0.0117 -0.0231 -0.0110  0.0098       0.9587
## X0688.HK  0.0758 -0.0535 -0.0501 -0.0520 -0.0099  0.0048       0.1024
## X0700.HK  0.0249 -0.0982 -0.0005 -0.0931  0.0006  0.0353       0.0168
## X0762.HK -0.0391 -0.0748 -0.0318 -0.0690  0.0193 -0.0206       0.1057
## X0836.HK -0.0526 -0.0389  0.0018  0.0098 -0.0075 -0.0168       0.7338
## X0857.HK  0.0454 -0.0144  0.0410 -0.0073 -0.0057  0.0052       0.7986
## X0883.HK  0.0445 -0.0493 -0.0114 -0.0315 -0.0593  0.0017       0.3320
## X0939.HK  0.0036 -0.0006  0.0200 -0.0587 -0.0355 -0.0346       0.5696
## X0941.HK -0.0141 -0.0189  0.0046 -0.0948  0.0037 -0.0225       0.2636
## X1044.HK -0.0346 -0.0445 -0.0985 -0.0588 -0.0401  0.0111       0.0304
## X1088.HK  0.0487 -0.0015 -0.0253 -0.0324  0.0307 -0.0360       0.5713
## X1109.HK  0.0312 -0.0182 -0.0560 -0.0928  0.0103 -0.0052       0.1243
## X1199.HK  0.0740  0.0491 -0.0050 -0.0678  0.0065  0.0338       0.1093
## X1299.HK -0.0233 -0.0934  0.0166 -0.0769 -0.1176 -0.0033       0.1740
## X1398.HK  0.0257 -0.0064  0.0671 -0.0287 -0.0258 -0.0378       0.4042
## X1880.HK  0.0039 -0.0810 -0.0766 -0.0268 -0.0369 -0.0391       0.0580
## X1898.HK  0.1022  0.0136  0.0060 -0.0001 -0.0504 -0.0206       0.1114
## X2318.HK  0.0736 -0.0590 -0.0676 -0.0429  0.0653  0.0040       0.0214
## X2388.HK  0.0731  0.0262  0.0571 -0.0027 -0.0407 -0.0161       0.2033
## X2600.HK  0.0730 -0.0412 -0.0235 -0.0021  0.0053  0.0051       0.4470
## X2628.HK  0.0021 -0.0290  0.0402 -0.0661 -0.0102 -0.0088       0.5032
```

```
## X3328.HK  0.0250  0.0333 -0.0031 -0.0646  0.0031 -0.0154       0.5855
## X3988.HK  0.0427 -0.0241  0.0406 -0.0481 -0.0093 -0.0715       0.1855
```

3.7 Downside Deviation - Distinct

```
##                                0001.HK 0002.HK 0003.HK 0004.HK 0005.HK
## Downside Deviation (MAR = 0%)  0.0193  0.0089  0.0157  0.0243  0.0258
##                                0006.HK 0011.HK 0012.HK 0013.HK 0016.HK
## Downside Deviation (MAR = 0%)   0.011  0.0152  0.0215  0.0194  0.0198
##                                0017.HK 0019.HK 0023.HK 0066.HK 0083.HK
## Downside Deviation (MAR = 0%)  0.0247   0.021  0.0207  0.0134  0.0257
##                                0101.HK 0144.HK 0151.HK 0267.HK 0291.HK
## Downside Deviation (MAR = 0%)  0.0256  0.0271  0.0218  0.0258   0.023
##                                0293.HK 0322.HK 0330.HK 0386.HK 0388.HK
## Downside Deviation (MAR = 0%)  0.0215  0.0202  0.0357  0.0208    0.02
##                                0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
## Downside Deviation (MAR = 0%)  0.0385  0.0261  0.0249  0.0226  0.0204
##                                0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
## Downside Deviation (MAR = 0%)  0.0212  0.0243  0.0212   0.016  0.0206
##                                1088.HK 1109.HK 1199.HK 1299.HK 1398.HK
## Downside Deviation (MAR = 0%)  0.0247  0.0291  0.0291  0.0202  0.0218
##                                1880.HK 1898.HK 2318.HK 2388.HK 2600.HK
## Downside Deviation (MAR = 0%)  0.0275  0.0303   0.027  0.0201  0.0301
##                                2628.HK 3328.HK 3988.HK
## Downside Deviation (MAR = 0%)   0.022  0.0226   0.022
```

4 General Statistics

Statistics Distinct

	Observations	NAs	Minimum	Quartile 1	Median	Arithmetic Mean
X0001.HK.Close	754	12	56.00	91.150	97.925	99.858
X0002.HK.Close	754	12	51.10	52.550	56.950	59.094
X0003.HK.Close	754	12	10.78	17.180	18.090	17.579
X0004.HK.Close	754	12	15.20	36.513	41.550	41.715
X0005.HK.Close	754	12	33.00	66.100	79.125	75.139
X0006.HK.Close	754	12	41.10	43.400	47.000	48.821
X0011.HK.Close	754	12	67.00	104.125	110.850	109.693
X0012.HK.Close	754	12	23.75	42.962	48.625	47.026
X0013.HK.Close	754	12	36.40	52.362	57.525	63.728
X0016.HK.Close	754	12	55.80	99.812	111.600	108.126
X0017.HK.Close	754	12	6.20	10.345	13.590	12.827
X0019.HK.Close	754	12	42.90	84.862	92.600	92.819
X0023.HK.Close	754	12	12.34	26.500	28.850	28.131
X0066.HK.Close	754	12	16.14	25.100	26.900	26.030
X0083.HK.Close	754	12	5.60	11.805	13.680	13.080
X0101.HK.Close	754	12	13.66	25.525	29.200	28.651
X0144.HK.Close	754	12	12.20	23.012	26.325	25.924
X0151.HK.Close	754	12	2.77	4.612	6.135	5.787
X0267.HK.Close	754	12	7.18	14.220	17.480	17.138
X0291.HK.Close	754	12	10.66	23.163	27.950	26.029
X0293.HK.Close	754	12	6.98	12.495	14.650	15.171
X0322.HK.Close	754	12	8.27	16.035	19.160	18.058
X0330.HK.Close	754	12	7.93	34.250	42.725	39.892
X0386.HK.Close	754	12	3.65	6.180	6.750	6.752
X0388.HK.Close	754	12	54.60	122.600	136.200	136.547
X0494.HK.Close	744	22	11.60	16.990	32.525	29.429
X0688.HK.Close	754	12	9.41	14.185	15.500	15.211
X0700.HK.Close	763	3	41.80	126.650	154.300	146.814
X0762.HK.Close	761	5	8.31	9.630	10.920	11.826
X0836.HK.Close	754	12	11.10	14.200	15.360	15.447
X0857.HK.Close	754	12	5.10	8.662	9.325	9.248
X0883.HK.Close	754	12	6.08	11.020	13.120	13.483
X0939.HK.Close	754	12	3.66	5.572	6.260	6.113
X0941.HK.Close	754	12	63.00	73.200	75.750	75.568
X1044.HK.Close	766	0	24.25	46.275	58.350	55.772
X1088.HK.Close	754	12	13.90	29.850	33.050	31.549
X1109.HK.Close	754	12	7.50	12.845	14.630	14.410
X1199.HK.Close	754	12	5.40	9.352	10.910	11.110
X1299.HK.Close	301	465	19.86	22.650	23.900	24.291
X1398.HK.Close	754	12	3.03	4.933	5.740	5.463
X1880.HK.Close	754	12	2.98	7.942	11.550	10.981
X1898.HK.Close	754	12	4.43	9.450	10.630	10.457
X2318.HK.Close	754	12	30.35	57.900	64.350	65.494
X2388.HK.Close	754	12	6.30	16.630	18.350	18.657
X2600.HK.Close	754	12	3.20	5.947	7.080	6.744
X2628.HK.Close	754	12	17.24	26.113	30.625	29.848
X3328.HK.Close	754	12	4.17	6.390	8.025	7.632
X3988.HK.Close	754	12	1.84	3.040	3.945	3.672

	Geometric Mean	Quartile 3	Maximum	SE Mean	LCL Mean (0.95)
X0001.HK.Close	98.465	114.000	135.70	0.5981	98.684
X0002.HK.Close	58.736	64.088	75.00	0.2423	58.619
X0003.HK.Close	17.440	19.000	21.00	0.0770	17.428
X0004.HK.Close	39.952	51.425	62.00	0.4089	40.912

```
## X0005.HK.Close          74.089     83.188   98.00  0.4326          74.290
## X0006.HK.Close          48.467     52.587   64.80  0.2219          48.386
## X0011.HK.Close         108.915    120.300  134.00  0.4637         108.783
## X0012.HK.Close          46.191     53.288   60.50  0.3026          46.432
## X0013.HK.Close          61.764     78.438   95.90  0.5877          62.574
## X0016.HK.Close         106.356    118.800  146.30  0.6672         106.816
## X0017.HK.Close          12.374     15.360   18.54  0.1198          12.592
## X0019.HK.Close          90.323    109.575  136.40  0.7355          91.375
## X0023.HK.Close          27.582     32.200   35.90  0.1868          27.765
## X0066.HK.Close          25.799     28.300   31.15  0.1204          25.794
## X0083.HK.Close          12.808     14.800   18.56  0.0920          12.899
## X0101.HK.Close          28.040     32.500   40.30  0.2062          28.246
## X0144.HK.Close          25.371     28.950   37.55  0.1869          25.557
## X0151.HK.Close           5.634      6.923    8.19  0.0497           5.689
## X0267.HK.Close          16.634     20.650   24.40  0.1461          16.851
## X0291.HK.Close          24.990     30.850   35.25  0.2420          25.553
## X0293.HK.Close          14.629     18.360   24.05  0.1497          14.877
## X0322.HK.Close          17.412     20.650   25.95  0.1641          17.736
## X0330.HK.Close          36.243     50.800   64.30  0.5195          38.872
## X0386.HK.Close           6.677      7.558    9.01  0.0375           6.678
## X0388.HK.Close         132.557    161.450  197.50  1.1100         134.368
## X0494.HK.Close          27.003     38.962   51.90  0.4241          28.596
## X0688.HK.Close          15.080     16.660   19.44  0.0721          15.069
## X0700.HK.Close         136.542    178.850  225.00  1.7185         143.440
## X0762.HK.Close          11.598     13.580   17.40  0.0913          11.647
## X0836.HK.Close          15.360     16.660   20.15  0.0615          15.326
## X0857.HK.Close           9.146     10.080   12.36  0.0501           9.150
## X0883.HK.Close          13.042     16.435   20.95  0.1263          13.235
## X0939.HK.Close           6.044      6.830    8.28  0.0346           6.045
## X0941.HK.Close          75.462     77.950   91.45  0.1465          75.280
## X1044.HK.Close          53.584     67.638   78.25  0.5178          54.756
## X1088.HK.Close          30.883     35.250   40.80  0.2142          31.129
## X1109.HK.Close          14.166     16.400   20.00  0.0959          14.222
## X1199.HK.Close          10.867     12.750   16.76  0.0870          10.939
## X1299.HK.Close          24.215     26.100   29.55  0.1141          24.066
## X1398.HK.Close           5.397      5.990    7.03  0.0317           5.401
## X1880.HK.Close          10.210     14.260   17.54  0.1416          10.703
## X1898.HK.Close          10.215     11.780   15.86  0.0805          10.299
## X2318.HK.Close          63.981     76.588   94.30  0.4957          64.521
## X2388.HK.Close          17.855     22.988   28.95  0.1884          18.287
## X2600.HK.Close           6.534      7.888   10.66  0.0620           6.622
## X2628.HK.Close          29.227     34.550   41.00  0.2157          29.424
## X3328.HK.Close           7.480      8.738   10.56  0.0564           7.521
## X3988.HK.Close           3.611      4.150    5.00  0.0261           3.621
##                 UCL Mean (0.95)  Variance   Stdev Skewness Kurtosis
## X0001.HK.Close          101.032  269.7551 16.4242  -0.0746  -0.1982
## X0002.HK.Close           59.570   44.2689  6.6535   0.4251  -1.2127
## X0003.HK.Close           17.730    4.4710  2.1145  -1.5784   1.8908
## X0004.HK.Close           42.517  126.0706 11.2281  -0.4488  -0.2850
## X0005.HK.Close           75.988  141.0798 11.8777  -0.8336   0.2633
## X0006.HK.Close           49.257   37.1146  6.0922   0.7213  -0.6895
## X0011.HK.Close          110.603  162.1287 12.7330  -0.5744   0.0379
## X0012.HK.Close           47.620   69.0350  8.3087  -0.9121   0.2487
## X0013.HK.Close           64.881  260.4553 16.1386   0.3999  -1.0076
## X0016.HK.Close          109.436  335.6224 18.3200  -0.8345   0.5541
## X0017.HK.Close           13.062   10.8206  3.2895  -0.5994  -0.8020
## X0019.HK.Close           94.263  407.8728 20.1959  -0.4864  -0.0141
```

```
## X0023.HK.Close          28.498   26.2977  5.1281  -1.1781   0.9238
## X0066.HK.Close          26.267   10.9232  3.3050  -1.3518   1.1106
## X0083.HK.Close          13.261    6.3863  2.5271  -1.0227   0.6688
## X0101.HK.Close          29.056   32.0709  5.6631  -0.5429  -0.0403
## X0144.HK.Close          26.291   26.3406  5.1323  -0.5031   0.2344
## X0151.HK.Close           5.885    1.8652  1.3657  -0.5064  -0.8417
## X0267.HK.Close          17.425   16.0955  4.0119  -0.4781  -0.5935
## X0291.HK.Close          26.503   44.1406  6.6438  -0.9830  -0.2031
## X0293.HK.Close          15.465   16.9029  4.1113   0.1203  -0.8048
## X0322.HK.Close          18.380   20.3027  4.5058  -0.7674  -0.2331
## X0330.HK.Close          40.912  203.5250 14.2662  -0.7681  -0.2708
## X0386.HK.Close           6.825    1.0614  1.0302  -0.6729   0.4716
## X0388.HK.Close         138.726  929.0582 30.4805  -0.5556   0.2264
## X0494.HK.Close          30.262  133.8255 11.5683  -0.0530  -1.4176
## X0688.HK.Close          15.352    3.9244  1.9810  -0.7377   0.0333
## X0700.HK.Close         150.187 2253.3537 47.4695  -0.6673  -0.3242
## X0762.HK.Close          12.005    6.3392  2.5178   0.7834  -0.8237
## X0836.HK.Close          15.567    2.8517  1.6887   0.1351  -0.3785
## X0857.HK.Close           9.347    1.8947  1.3765  -0.7647   0.8104
## X0883.HK.Close          13.731   12.0193  3.4669  -0.0234  -0.7347
## X0939.HK.Close           6.181    0.9001  0.9487  -0.7157  -0.0244
## X0941.HK.Close          75.855   16.1760  4.0219   0.0419   0.7443
## X1044.HK.Close          56.789  205.4152 14.3323  -0.7137  -0.6224
## X1088.HK.Close          31.970   34.5833  5.8808  -1.3360   1.2775
## X1109.HK.Close          14.598    6.9274  2.6320  -0.4343  -0.2364
## X1199.HK.Close          11.280    5.7018  2.3878   0.0825  -0.5761
## X1299.HK.Close          24.515    3.9196  1.9798   0.4053  -0.9217
## X1398.HK.Close           5.525    0.7596  0.8715  -0.9448   0.2817
## X1880.HK.Close          11.259   15.1235  3.8889  -0.4108  -0.9757
## X1898.HK.Close          10.615    4.8866  2.2106  -0.5284   0.2508
## X2318.HK.Close          66.468  185.2658 13.6112  -0.2250  -0.3712
## X2388.HK.Close          19.027   26.7754  5.1745  -0.3815  -0.3115
## X2600.HK.Close           6.866    2.8992  1.7027  -0.4724  -0.6095
## X2628.HK.Close          30.271   35.0938  5.9240  -0.4382  -0.8655
## X3328.HK.Close           7.742    2.3965  1.5481  -0.5299  -0.8453
## X3988.HK.Close           3.724    0.5147  0.7174  -0.8308  -0.3447
```

4.1 Higher Moments - Distinct

```
##                 0001.HK 0002.HK 0003.HK 0004.HK 0005.HK 0006.HK 0011.HK
## CoSkewness       0.0000  0.0000  0.0000   0.000  0.0000  0.0000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000   0.000  0.0000  0.0000  0.0000
## Beta CoVariance  0.9876  0.1493  0.3808   1.107  1.1219  0.1180  0.6402
## Beta CoSkewness  1.0059 -0.5794 -0.4112   1.860  0.9725 -0.1846  0.9970
## Beta CoKurtosis  0.9987  0.0855  0.3597   1.121  1.2809  0.0900  0.7212
##                 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   1.022  0.9478  1.0050  1.1290  0.7830  0.9422  0.5120
## Beta CoSkewness   2.017  0.1284  1.4042  0.6804  1.4163  1.8817  0.2619
## Beta CoKurtosis   1.076  0.8999  0.9884  1.1269  0.7994  0.9887  0.4545
##                 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   1.165   1.094   1.316  0.4275  1.0811  0.8885  0.7711
## Beta CoSkewness   1.258   2.821   1.570 -1.4668  1.3306  0.2178  1.0614
## Beta CoKurtosis   1.173   1.169   1.212  0.3346  0.9865  0.7674  0.7561
##                 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  0.3492  0.9406  0.9535   1.158  0.9678   1.183  0.9342
## Beta CoSkewness -0.1986 -0.6069 -0.1226   1.802  2.1715   3.728  1.5862
## Beta CoKurtosis  0.3070  0.8982  0.8866   1.144  0.9763   1.264  0.8972
##                 0762.HK 0836.HK 0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
## CoSkewness       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance  0.6989  0.5578  1.1021  1.2836  1.0614  0.7105  0.4659
## Beta CoSkewness -0.5854 -0.8246  0.5404  0.8598  0.6076  0.7097  0.0093
## Beta CoKurtosis  0.5361  0.4904  1.0085  1.2081  1.0414  0.7045  0.3958
##                 1088.HK 1109.HK 1199.HK 1299.HK 1398.HK 1880.HK 1898.HK
## CoSkewness       0.0000   0.000   0.000  0.0000  0.0000  0.0000  0.0000
## CoKurtosis       0.0000   0.000   0.000  0.0000  0.0000  0.0000  0.0000
## Beta CoVariance  1.2187   1.160   1.337  0.8262  1.1255  0.8213  1.4932
## Beta CoSkewness  0.9747   3.361   0.823  1.7800  0.9625  0.1576  0.9013
## Beta CoKurtosis  1.0931   1.141   1.260  0.9914  1.0650  0.7660  1.3846
##                 2318.HK 2388.HK 2600.HK 2628.HK 3328.HK 3988.HK
## CoSkewness        0.000  0.0000   0.000  0.0000  0.0000  0.0000
## CoKurtosis        0.000  0.0000   0.000  0.0000  0.0000  0.0000
## Beta CoVariance   1.318  0.8778   1.533  1.0834  1.1936  1.0331
## Beta CoSkewness   2.013  0.8382   2.106  0.8253  0.9979  0.2707
## Beta CoKurtosis   1.314  0.8494   1.444  1.0339  1.1850  0.9685
```

4.2 Higher Moments - Combined

```
##                 HSI Components to HSI Combined
## CoSkewness                              0.0000
## CoKurtosis                              0.0000
## Beta CoVariance                         1.1735
## Beta CoSkewness                         0.3832
## Beta CoKurtosis                         1.1250
```

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     4.9337 1.45544 1.18336 1.17245 1.03580 1.01051
## Proportion of Variance 0.5071 0.04413 0.02917 0.02864 0.02235 0.02127
## Cumulative Proportion  0.5071 0.55125 0.58043 0.60906 0.63142 0.65269
##                         Comp.7 Comp.8  Comp.9 Comp.10 Comp.11 Comp.12
## Standard deviation     0.96045 0.9449 0.91431 0.89722 0.85516 0.84644
## Proportion of Variance 0.01922 0.0186 0.01742 0.01677 0.01524 0.01493
## Cumulative Proportion  0.67191 0.6905 0.70792 0.72469 0.73993 0.75486
##                        Comp.13 Comp.14 Comp.15 Comp.16 Comp.17 Comp.18
## Standard deviation     0.81951 0.80641 0.77095 0.75661 0.75449 0.71066
## Proportion of Variance 0.01399 0.01355 0.01238 0.01193 0.01186 0.01052
## Cumulative Proportion  0.76885 0.78240 0.79478 0.80671 0.81856 0.82909
##                        Comp.19  Comp.20  Comp.21  Comp.22 Comp.23  Comp.24
## Standard deviation     0.69845 0.690170 0.683099 0.658197 0.64658 0.634286
## Proportion of Variance 0.01016 0.009924 0.009721 0.009025 0.00871 0.008382
## Cumulative Proportion  0.83925 0.849173 0.858894 0.867920 0.87663 0.885011
##                         Comp.25 Comp.26  Comp.27  Comp.28  Comp.29 Comp.30
## Standard deviation     0.621698 0.60912 0.590024 0.574715 0.566011 0.56198
## Proportion of Variance 0.008052 0.00773 0.007253 0.006881 0.006674 0.00658
## Cumulative Proportion  0.893064 0.90079 0.908046 0.914927 0.921601 0.92818
##                         Comp.31  Comp.32  Comp.33  Comp.34  Comp.35
## Standard deviation     0.551475 0.529390 0.521833 0.510663 0.498417
## Proportion of Variance 0.006336 0.005839 0.005673 0.005433 0.005175
## Cumulative Proportion  0.934517 0.940356 0.946029 0.951462 0.956637
##                         Comp.36  Comp.37  Comp.38  Comp.39  Comp.40
## Standard deviation     0.484346 0.474585 0.461822 0.446093 0.436886
## Proportion of Variance 0.004887 0.004692 0.004443 0.004146 0.003976
## Cumulative Proportion  0.961524 0.966217 0.970660 0.974806 0.978782
##                         Comp.41 Comp.42  Comp.43  Comp.44  Comp.45
## Standard deviation     0.416768  0.3919 0.384420 0.366201 0.337535
## Proportion of Variance 0.003619  0.0032 0.003079 0.002794 0.002374
## Cumulative Proportion  0.982401  0.9856 0.988680 0.991474 0.993847
##                         Comp.46  Comp.47  Comp.48
## Standard deviation     0.328220 0.315275 0.296988
## Proportion of Variance 0.002244 0.002071 0.001838
## Cumulative Proportion  0.996092 0.998162 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        -0.192 -0.105                              -0.136
## X0002.HK        -0.459 -0.113        -0.177        -0.162 -0.106  0.176
## X0003.HK        -0.347 -0.288         0.144        -0.134
## X0004.HK -0.160
## X0005.HK -0.166                                                   -0.129
## X0006.HK        -0.479               -0.159        -0.376 -0.193 -0.108
## X0011.HK -0.154        -0.269        -0.145                0.165  0.114
## X0012.HK -0.163        -0.167 -0.104                0.162        -0.147
## X0013.HK -0.164        -0.168
## X0016.HK -0.173        -0.129 -0.103                0.111        -0.177
## X0017.HK -0.144        -0.152 -0.166                      -0.215 -0.284
## X0019.HK -0.124        -0.262  0.105         0.159  0.234
## X0023.HK -0.154        -0.101        -0.203                0.219  0.234
## X0066.HK -0.140 -0.139 -0.219                0.161  0.141         0.186
```

```
## X0083.HK -0.153        -0.133 -0.173                       -0.122 -0.236
## X0101.HK -0.155        -0.104 -0.143        -0.108 -0.109  0.119
## X0144.HK -0.155                      0.135 -0.140        -0.211 -0.119
## X0151.HK         0.113         0.527  0.185  0.178        -0.195 -0.184
## X0267.HK -0.159                             0.133
## X0291.HK -0.129                                           -0.295
## X0293.HK -0.132  0.130 -0.116               -0.203  0.139 -0.219  0.202
## X0322.HK         0.144 -0.211  0.546                -0.194  0.186 -0.146
## X0330.HK         0.118                0.328  0.398 -0.299 -0.274  0.413
## X0386.HK -0.138 -0.235  0.193         0.292 -0.107  0.200
## X0388.HK -0.171                             0.139
## X0494.HK                0.108               0.263 -0.373  0.215 -0.404
## X0688.HK -0.154  0.188  0.125                      -0.219         0.101
## X0700.HK -0.137         0.161        -0.204 -0.205        -0.200
## X0762.HK -0.127 -0.121  0.245  0.165  0.147 -0.166  0.135  0.157
## X0836.HK               -0.213 -0.167  0.624 -0.246 -0.152  0.146
## X0857.HK -0.155 -0.175  0.170         0.167         0.147
## X0883.HK -0.167         0.162
## X0939.HK -0.173         0.130                       0.116
## X0941.HK -0.122 -0.299         0.117  0.113         0.180 -0.106  0.193
## X1044.HK -0.104  0.135         0.363 -0.111 -0.180        -0.204
## X1088.HK -0.165         0.108
## X1109.HK -0.154  0.231                             -0.195         0.128
## X1199.HK -0.157         0.191                             -0.170 -0.109
## X1299.HK -0.131                             -0.372 -0.171  0.262  0.133
## X1398.HK -0.179         0.130                              0.135
## X1880.HK -0.130                             -0.291 -0.257 -0.200
## X1898.HK -0.157                              0.204 -0.111  0.104  0.136
## X2318.HK -0.167         0.108                0.115
## X2388.HK -0.161                      -0.161                       0.146
## X2600.HK -0.158         0.141                0.103
## X2628.HK -0.158         0.122                0.192
## X3328.HK -0.174         0.131                              0.120
## X3988.HK -0.174                                            0.187
##          Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15 Comp.16 Comp.17
## X0001.HK                                  0.103           0.139
## X0002.HK                 -0.119   0.196                  -0.195
## X0003.HK  0.122           0.279  -0.298   0.135           0.148
## X0004.HK                          0.131   0.223          -0.309
## X0005.HK         -0.216
## X0006.HK  0.170          -0.318          -0.203   0.240          -0.106
## X0011.HK         -0.133                   0.120
## X0012.HK                  0.112   0.144                          0.207
## X0013.HK -0.132          -0.144           0.134  -0.143          -0.103
## X0016.HK                          0.107
## X0017.HK         -0.299          -0.151  -0.193                  0.166
## X0019.HK          0.333  -0.405  -0.238           0.144          0.129
## X0023.HK          0.131           0.169                   0.140
## X0066.HK -0.163                   0.128                          -0.393
## X0083.HK  0.127           0.170   0.255           0.186          0.125
## X0101.HK -0.147           0.178  -0.180
## X0144.HK                                         -0.184   0.157
## X0151.HK  0.112  -0.111                    0.292   0.176   0.111
## X0267.HK                 -0.163   0.110   0.121  -0.168  -0.119
## X0291.HK          0.413   0.346  -0.195  -0.249  -0.221  -0.246   0.105
## X0293.HK -0.226          -0.194          -0.256  -0.192
## X0322.HK  0.242                   0.106  -0.281  -0.381  -0.139  -0.124
```

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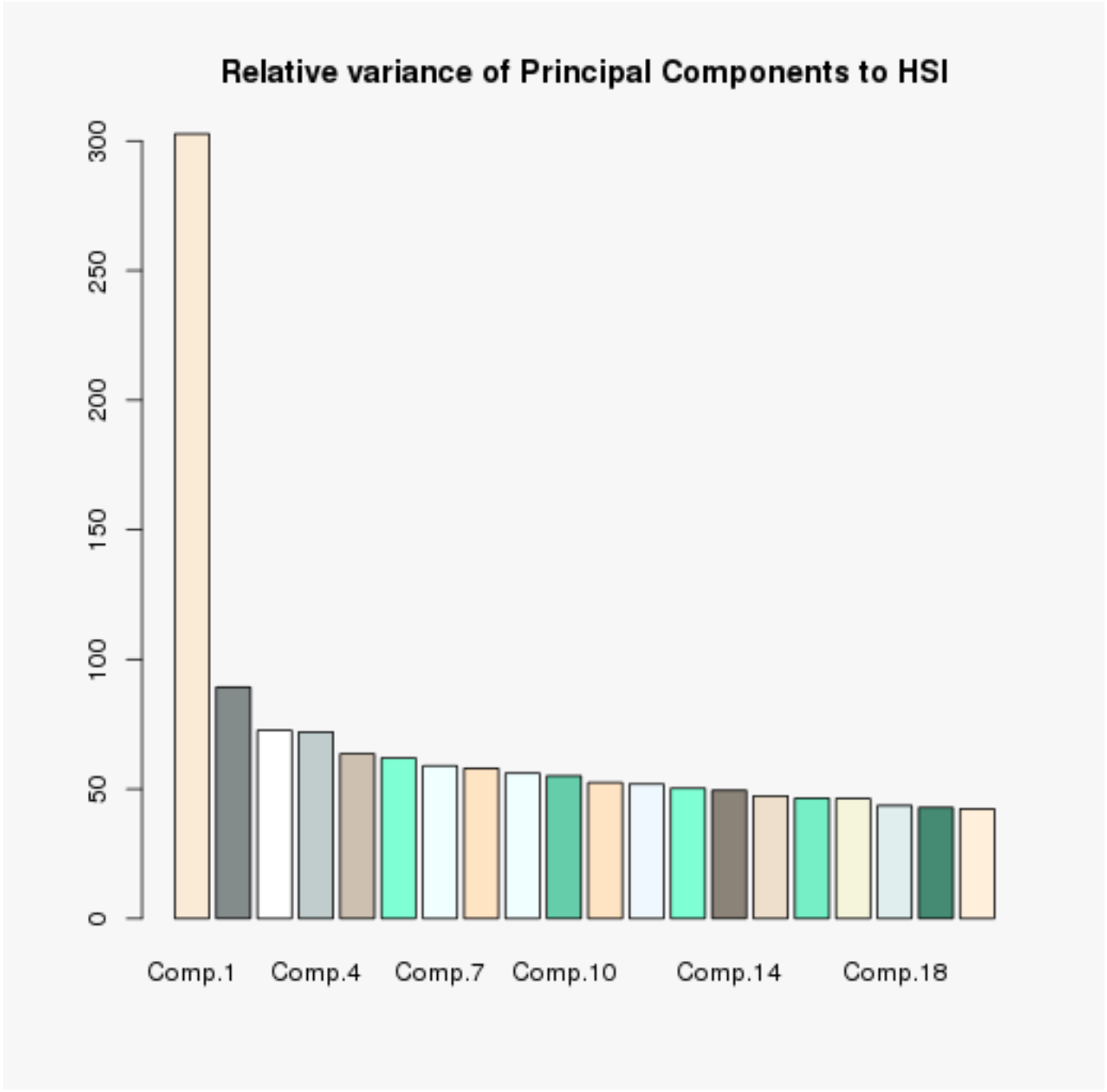
## X0330.HK -0.187  -0.243           0.130                            0.147
## X0386.HK                  -0.122  -0.160                   -0.114  -0.146
## X0388.HK         -0.120                                    -0.153
## X0494.HK -0.546   0.302           0.125          -0.113   0.125   0.126
## X0688.HK  0.279   0.117   0.112   0.121   0.128
## X0700.HK -0.101                   0.198   0.174  -0.143   0.126
## X0762.HK                          0.231                   -0.191   0.568
## X0836.HK          0.156  -0.235   0.232  -0.112   0.173          -0.146
## X0857.HK -0.101           0.100  -0.122          -0.119  -0.238  -0.180
## X0883.HK                                          -0.117  -0.127
## X0939.HK  0.127                            -0.259           0.229
## X0941.HK                  0.251   0.209          -0.134   0.356
## X1044.HK -0.352           0.205          -0.199   0.546  -0.136  -0.131
## X1088.HK                 -0.103           0.216
## X1109.HK  0.232   0.227           0.117   0.130
## X1199.HK         -0.209                                            -0.227
## X1299.HK         -0.313   0.123  -0.198
## X1398.HK  0.134                            -0.237           0.104
## X1880.HK                                  -0.301   0.219           0.232
## X1898.HK                 -0.179  -0.129
## X2318.HK          0.130  -0.147                    0.115
## X2388.HK -0.101  -0.143          -0.171  -0.113           0.152   0.105
## X2600.HK  0.131                  -0.110                   -0.246
## X2628.HK                                           0.113  -0.184  -0.329
## X3328.HK                                  -0.118  -0.129   0.186
## X3988.HK                  0.101           -0.277           0.214
##          Comp.18 Comp.19 Comp.20 Comp.21 Comp.22 Comp.23 Comp.24 Comp.25
## X0001.HK                                   0.178
## X0002.HK  0.177           0.140                    0.138   0.144   0.153
## X0003.HK -0.378  -0.187                            -0.239
## X0004.HK                          -0.147   0.101                    0.344
## X0005.HK -0.101  -0.185                    0.130  -0.227
## X0006.HK -0.145                                           -0.115
## X0011.HK -0.105   0.115  -0.186           -0.175                   -0.146
## X0012.HK          0.110           0.158                    0.159
## X0013.HK                                   0.270   0.212
## X0016.HK                          0.160                   -0.134
## X0017.HK                                  -0.177           0.155
## X0019.HK         -0.259           0.264           0.162  -0.226   0.112
## X0023.HK  0.161           -0.175  -0.139          -0.251  -0.226
## X0066.HK  0.242  -0.141   0.246           -0.277          -0.159
## X0083.HK                          0.169                            -0.204
## X0101.HK -0.129   0.395   0.145           -0.209
## X0144.HK         -0.177  -0.299  -0.213                    0.150  -0.225
## X0151.HK          0.122          -0.315                            0.149
## X0267.HK                          0.141  -0.111  -0.163           -0.433
## X0291.HK  0.109           0.158  -0.281   0.246   0.122  -0.120  -0.246
## X0293.HK -0.337           -0.141                   -0.398   0.265   0.201
## X0322.HK                          0.261
## X0330.HK          0.159           0.155                   -0.227
## X0386.HK                                  -0.224   0.190
## X0388.HK         -0.157           -0.228                   0.142   0.110
## X0494.HK         -0.178
## X0688.HK -0.104           -0.111           -0.126   0.133           0.106
## X0700.HK -0.417   0.232   0.323                    0.198  -0.285  -0.164
## X0762.HK         -0.213   0.144                   -0.139
## X0836.HK                  0.167  -0.173
```

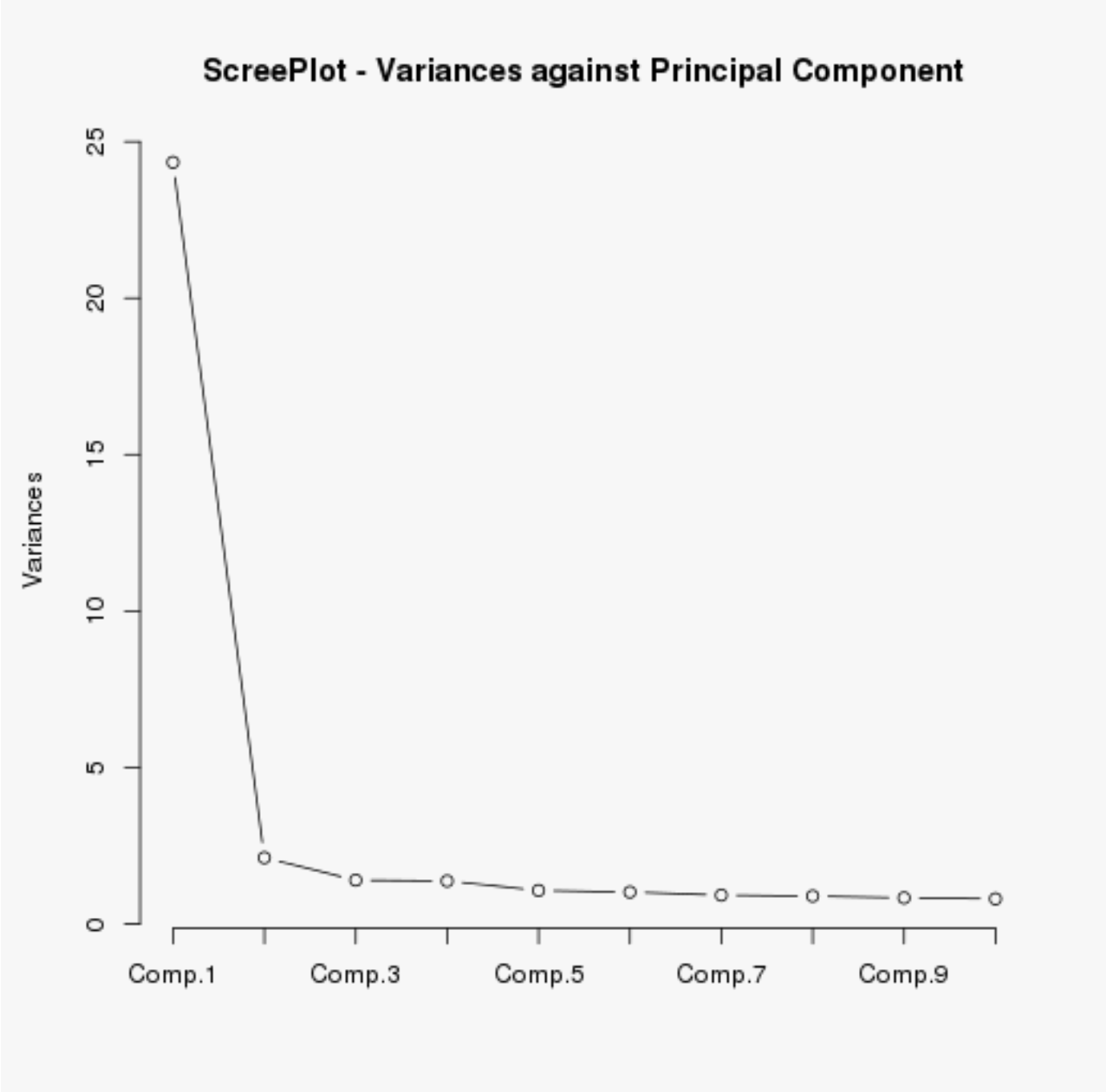
```
## X0857.HK          0.213  -0.202                  -0.114           0.192
## X0883.HK  0.189   0.124  -0.150   0.134   0.221  -0.216  -0.258   0.156
## X0939.HK                                                         0.104
## X0941.HK                         0.171           0.233   0.343
## X1044.HK                 -0.145
## X1088.HK  0.101   0.209  -0.229  -0.106                   0.192  -0.183
## X1109.HK -0.100  -0.102  -0.130          -0.134           0.103   0.145
## X1199.HK  0.109  -0.273                   0.113           -0.198
## X1299.HK -0.110  -0.304           0.223   0.186   0.312
## X1398.HK                                                 -0.102
## X1880.HK  0.387           0.349   0.255  -0.125  -0.321   0.106
## X1898.HK  0.144   0.190  -0.194   0.113   0.132                   -0.360
## X2318.HK -0.186           0.243           0.229
## X2388.HK          0.104           -0.287   0.108           0.212
## X2600.HK         -0.165  -0.115           -0.465   0.106
## X2628.HK -0.193           0.274   0.100   0.200  -0.113   0.316  -0.157
## X3328.HK
## X3988.HK                         -0.131
##          Comp.26 Comp.27 Comp.28 Comp.29 Comp.30 Comp.31 Comp.32 Comp.33
## X0001.HK                 -0.117   0.150
## X0002.HK -0.122                   -0.131           0.414           -0.305
## X0003.HK -0.261   0.152  -0.228           -0.106
## X0004.HK -0.133           0.180           -0.195  -0.341           0.167
## X0005.HK  0.197  -0.220  -0.147   0.159  -0.140   0.178   0.193  -0.311
## X0006.HK                  0.125           0.141  -0.260           0.147
## X0011.HK         -0.304   0.139  -0.202   0.115  -0.309           -0.194
## X0012.HK          0.221   0.129   0.266                   0.128  -0.181
## X0013.HK          0.233  -0.297   0.317   0.182   0.100  -0.119
## X0016.HK                  0.111           -0.147           0.142   0.237
## X0017.HK                 -0.240  -0.210                   -0.409   0.302
## X0019.HK         -0.288                           0.149
## X0023.HK  0.113  -0.220                                    -0.113   0.176
## X0066.HK  0.153   0.260                   0.174   0.114
## X0083.HK  0.208                  -0.158   0.251           0.190
## X0101.HK         -0.127   0.331   0.136  -0.171   0.223           0.141
## X0144.HK -0.208  -0.150   0.218   0.285   0.156           -0.207  -0.223
## X0151.HK  0.283   0.132   0.187  -0.245
## X0267.HK -0.365   0.260   0.154  -0.137
## X0291.HK  0.172
## X0293.HK  0.218   0.272   0.118                   0.123
## X0322.HK         -0.132           0.143                   0.160   0.114
## X0330.HK         -0.116           0.167   0.164
## X0386.HK  0.104                           0.273  -0.128   0.325
## X0388.HK -0.115           -0.192           0.125  -0.183   0.248  -0.112
## X0494.HK                         -0.154
## X0688.HK          0.124  -0.181  -0.235   0.148   0.113
## X0700.HK                 -0.163           -0.132
## X0762.HK                 -0.149   0.128                           0.305
## X0836.HK                 -0.166           -0.232                  -0.131
## X0857.HK                 -0.146  -0.201
## X0883.HK -0.174          -0.142  -0.194                   -0.276  -0.260
## X0939.HK -0.124   0.162
## X0941.HK         -0.117                   -0.225  -0.262  -0.124
## X1044.HK -0.261           -0.160   0.123
## X1088.HK  0.113                   0.186           0.274           0.176
## X1109.HK -0.104                           0.112   0.178           0.100
## X1199.HK -0.230           0.259           -0.255   0.236   0.250   0.224
```

```
## X1299.HK  0.176   0.137   0.219  -0.175                                          
## X1398.HK                  0.134                                                  
## X1880.HK                                                    -0.172   0.116     
## X1898.HK  0.119   0.302  -0.110          -0.383            0.138               
## X2318.HK                  0.118           0.116                                 
## X2388.HK -0.211  -0.162          -0.210                    0.315   0.121     
## X2600.HK  0.254           -0.111   0.170  -0.349  -0.123           -0.123     
## X2628.HK          -0.211                                  -0.266   0.117     
## X3328.HK                                                           -0.137     
## X3988.HK                  0.142   0.133   0.112            -0.143              
##           Comp.34 Comp.35 Comp.36 Comp.37 Comp.38 Comp.39 Comp.40 Comp.41
## X0001.HK -0.155   0.144  -0.141   0.177   0.270            0.139   0.260     
## X0002.HK                  0.110   0.136   0.126   0.102                      
## X0003.HK          -0.167   0.142                                             
## X0004.HK  0.321  -0.312   0.118                   -0.208   0.154             
## X0005.HK  0.330   0.216  -0.218  -0.153   0.174  -0.211           -0.249     
## X0006.HK           0.132  -0.130  -0.125                                     
## X0011.HK                  -0.264   0.160  -0.102            -0.390           
## X0012.HK -0.141   0.365   0.109   0.182  -0.195            -0.112  -0.232     
## X0013.HK                  -0.102  -0.136                    -0.224   0.198     
## X0016.HK -0.265           -0.126   0.127            0.183   0.259  -0.113     
## X0017.HK  0.151   0.140   0.154   0.100                    -0.147  -0.151     
## X0019.HK                  -0.154                                             
## X0023.HK  0.198   0.211   0.403           0.107   0.218                      
## X0066.HK -0.103  -0.108                   -0.127  -0.217           -0.266     
## X0083.HK          -0.324   0.230  -0.285                    0.118   0.309     
## X0101.HK                  -0.156  -0.332   0.232            -0.101           
## X0144.HK -0.167  -0.196   0.150           0.204            0.103  -0.230     
## X0151.HK           0.102                  0.125                              
## X0267.HK  0.269   0.321                                    0.125   0.224     
## X0291.HK                                                                     
## X0293.HK                                                                     
## X0322.HK                                                   -0.146            
## X0330.HK                                                                     
## X0386.HK  0.106           0.122   0.178   0.253            -0.156   0.116     
## X0388.HK          -0.153  -0.109                    0.578                     
## X0494.HK                                                                     
## X0688.HK          -0.103  -0.133           0.138  -0.164  -0.115  -0.120     
## X0700.HK  0.103                           -0.155                    -0.138     
## X0762.HK -0.185           -0.195           0.137                              
## X0836.HK                                  -0.104                             
## X0857.HK           0.134   0.126  -0.144                             -0.206     
## X0883.HK -0.135  -0.169  -0.151          -0.137                              
## X0939.HK  0.172           -0.265          -0.141   0.119                      
## X0941.HK  0.105                   -0.166  -0.101            -0.101   0.122     
## X1044.HK                                                                     
## X1088.HK  0.239  -0.123           0.143  -0.561            0.131             
## X1109.HK           0.158                                                     
## X1199.HK                          0.108  -0.165            -0.385   0.197     
## X1299.HK           0.105                                    0.132   0.194     
## X1398.HK                          0.151                             -0.244     
## X1880.HK                                                                     
## X1898.HK          -0.237                   0.242   0.113  -0.156  -0.213     
## X2318.HK -0.205           0.399  -0.307  -0.141            -0.335             
## X2388.HK -0.231   0.209           -0.182          -0.363   0.298             
## X2600.HK -0.283   0.128           -0.220  -0.121            0.141   0.297     
## X2628.HK -0.226                   0.201            0.163   0.172             
```

```
## X3328.HK         -0.137   0.174   0.454   0.142  -0.314           0.220
## X3988.HK  0.113                                   0.137
##           Comp.42 Comp.43 Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## X0001.HK -0.108  -0.177   0.325  -0.230           0.520
## X0002.HK  0.139  -0.153
## X0003.HK
## X0004.HK  0.165          -0.154
## X0005.HK         -0.230
## X0006.HK -0.107   0.141
## X0011.HK  0.257
## X0012.HK -0.119   0.305  -0.238  -0.102   0.153          -0.100
## X0013.HK  0.224                                  -0.413   0.136
## X0016.HK         -0.290           0.403  -0.192  -0.358  -0.190
## X0017.HK                                  -0.112
## X0019.HK          0.136                    0.118
## X0023.HK -0.146          -0.150  -0.136          -0.147  -0.143
## X0066.HK -0.135
## X0083.HK          0.140          -0.125                   0.120
## X0101.HK -0.265
## X0144.HK
## X0151.HK
## X0267.HK                  0.108   0.121   0.106
## X0291.HK
## X0293.HK
## X0322.HK
## X0330.HK
## X0386.HK -0.138  -0.166  -0.341
## X0388.HK -0.282   0.112   0.223   0.171   0.172
## X0494.HK
## X0688.HK         -0.177                   0.509          -0.255
## X0700.HK          0.185
## X0762.HK
## X0836.HK
## X0857.HK  0.372   0.182   0.391  -0.136   0.131          -0.116
## X0883.HK -0.374          -0.260   0.172  -0.161
## X0939.HK         -0.131  -0.113  -0.484  -0.260  -0.149  -0.398
## X0941.HK                  0.127                            0.140
## X1044.HK         -0.127
## X1088.HK         -0.173                           0.110
## X1109.HK          0.259                   -0.581           0.264
## X1199.HK                          -0.117
## X1299.HK
## X1398.HK         -0.266          -0.174   0.205  -0.218   0.685
## X1880.HK  0.164
## X1898.HK          0.126                           0.145
## X2318.HK         -0.355   0.177          -0.158   0.109  -0.137
## X2388.HK                 -0.139
## X2600.HK
## X2628.HK          0.123  -0.252  -0.236
## X3328.HK -0.124   0.258   0.367   0.165          -0.256  -0.177
## X3988.HK  0.427   0.134  -0.201   0.468   0.110   0.387
##
##                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   0.688   0.708   0.729   0.750
##                Comp.37 Comp.38 Comp.39 Comp.40 Comp.41 Comp.42 Comp.43
## SS loadings      1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var   0.021   0.021   0.021   0.021   0.021   0.021   0.021
## Cumulative Var   0.771   0.792   0.812   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   0.938   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

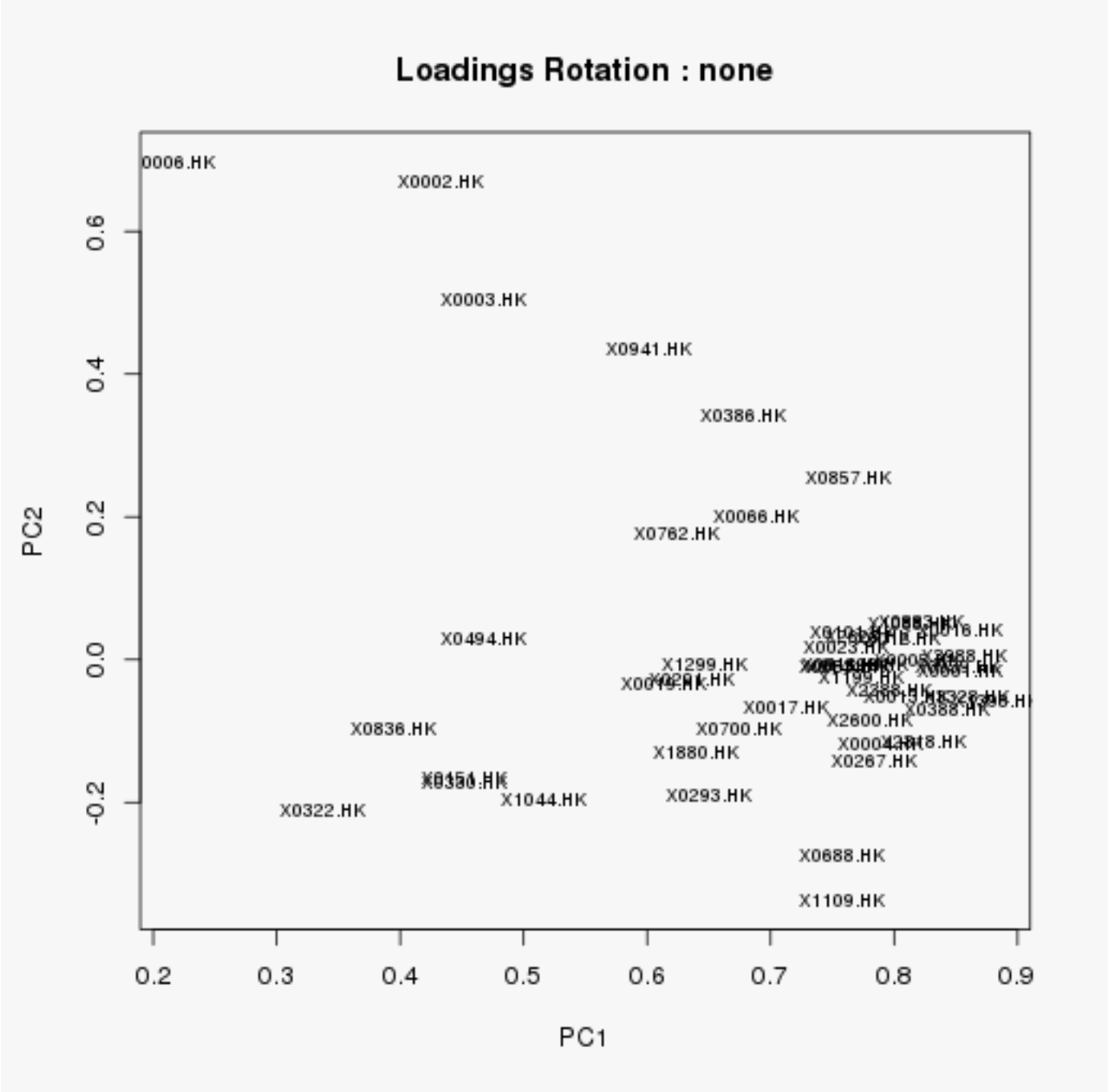
5.2.1 Rotation : none

```
## 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 -0.06 -0.15  0.00 -0.06 0.81 0.19
## X3328.HK   47 0.86 -0.05 -0.15 -0.07  0.00 0.77 0.23
## X3988.HK   48 0.86  0.00 -0.11  0.01  0.00 0.75 0.25
## X0001.HK    1 0.85 -0.02  0.23 -0.12 -0.07 0.80 0.20
## X0016.HK   10 0.85  0.04  0.15 -0.12 -0.07 0.77 0.23
## X0939.HK   33 0.85 -0.01 -0.15  0.07  0.02 0.75 0.25
## X0388.HK   25 0.84 -0.07  0.09 -0.04 -0.09 0.73 0.27
## X2318.HK   43 0.82 -0.11 -0.13 -0.03 -0.07 0.71 0.29
## X0883.HK   32 0.82  0.05 -0.19  0.01 -0.01 0.71 0.29
## X0005.HK    5 0.82  0.00 -0.11 -0.03 -0.01 0.68 0.32
## X1088.HK   36 0.81  0.05 -0.13  0.07  0.06 0.69 0.31
## X0013.HK    9 0.81 -0.05  0.20 -0.09 -0.07 0.71 0.29
## X0012.HK    8 0.80  0.03  0.20 -0.12  0.00 0.70 0.30
## X2388.HK   44 0.80 -0.04  0.06  0.03 -0.17 0.67 0.33
## X0004.HK    4 0.79 -0.12  0.11 -0.11 -0.08 0.67 0.33
## X0267.HK   19 0.78 -0.14  0.04  0.09  0.09 0.65 0.35
## X2600.HK   45 0.78 -0.09 -0.17 -0.03 -0.06 0.65 0.35
## X2628.HK   46 0.78  0.03 -0.14  0.01 -0.02 0.63 0.37
## X1898.HK   42 0.78 -0.01 -0.10 -0.01 -0.07 0.62 0.38
## X1199.HK   38 0.77 -0.02 -0.23 -0.11  0.05 0.66 0.34
## X0101.HK   16 0.77  0.04  0.12 -0.17  0.03 0.63 0.37
## X0144.HK   17 0.76 -0.01 -0.12  0.01  0.14 0.62 0.38
## X0857.HK   31 0.76  0.25 -0.20  0.01  0.17 0.72 0.28
## X0023.HK   13 0.76  0.02  0.12  0.05 -0.21 0.64 0.36
## X0011.HK    7 0.76 -0.01  0.32 -0.04 -0.15 0.70 0.30
## X1109.HK   37 0.76 -0.34 -0.11 -0.11 -0.01 0.71 0.29
## X0688.HK   27 0.76 -0.27 -0.15 -0.10 -0.08 0.69 0.31
## X0083.HK   15 0.76 -0.01  0.16 -0.20 -0.02 0.64 0.36
## X0017.HK   11 0.71 -0.07  0.18 -0.19  0.03 0.58 0.42
## X0066.HK   14 0.69  0.20  0.26  0.00 -0.03 0.58 0.42
## X0386.HK   24 0.68  0.34 -0.23  0.01  0.30 0.72 0.28
## X0700.HK   28 0.67 -0.10 -0.19  0.12 -0.21 0.56 0.44
## X0293.HK   21 0.65 -0.19  0.14 -0.03 -0.03 0.48 0.52
## X1299.HK   39 0.65 -0.01  0.05  0.01  0.09 0.43 0.57
## X1880.HK   41 0.64 -0.13 -0.11  0.05 -0.06 0.44 0.56
## X0291.HK   20 0.64 -0.03  0.07 -0.06  0.00 0.41 0.59
## X0762.HK   29 0.62  0.18 -0.29  0.19  0.15 0.57 0.43
## X0019.HK   12 0.61 -0.03  0.31  0.12  0.01 0.49 0.51
## X0941.HK   34 0.60  0.44 -0.10  0.14  0.12 0.59 0.41
## X1044.HK   35 0.52 -0.20  0.04  0.43 -0.11 0.50 0.50
## X0494.HK   26 0.47  0.03 -0.13  0.03 -0.08 0.24 0.76
## X0330.HK   23 0.45 -0.17  0.00 -0.09  0.34 0.36 0.64
## X0006.HK    6 0.22  0.70 -0.08 -0.02 -0.17 0.57 0.43
## X0002.HK    2 0.43  0.67  0.13  0.11 -0.18 0.70 0.30
## X0003.HK    3 0.47  0.50  0.34  0.10  0.15 0.62 0.38
## X0322.HK   22 0.34 -0.21  0.25  0.64  0.04 0.63 0.37
## X0151.HK   18 0.45 -0.17  0.06  0.62  0.19 0.65 0.35
## X0836.HK   30 0.39 -0.10  0.25 -0.20  0.65 0.68 0.32
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.34 2.12 1.40 1.37 1.07
```

```
## Proportion Var  0.51 0.04 0.03 0.03 0.02
## Cumulative Var  0.51 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  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1


##              PC1       PC2
## X0001.HK 0.8533 -0.015495
## X0002.HK 0.4332  0.668768
## X0003.HK 0.4670  0.504749
## X0004.HK 0.7894 -0.117328
## X0005.HK 0.8182  0.000385
## X0006.HK 0.2163  0.697484
## X0011.HK 0.7595 -0.006928
## X0012.HK 0.8021  0.030353
## X0013.HK 0.8099 -0.053171
## X0016.HK 0.8528  0.041050
## X0017.HK 0.7119 -0.065676
## X0019.HK 0.6138 -0.032698
## X0023.HK 0.7610  0.017920
## X0066.HK 0.6889  0.201706
## X0083.HK 0.7570 -0.010474
## X0101.HK 0.7666  0.039556
## X0144.HK 0.7630 -0.010627
## X0151.HK 0.4513 -0.165083
## X0267.HK 0.7838 -0.141322
## X0291.HK 0.6367 -0.027487
## X0293.HK 0.6507 -0.189319
## X0322.HK 0.3367 -0.209706
## X0330.HK 0.4524 -0.171544
## X0386.HK 0.6785  0.342432
## X0388.HK 0.8429 -0.071203
## X0494.HK 0.4674  0.028424
## X0688.HK 0.7579 -0.272914
## X0700.HK 0.6744 -0.096131
## X0762.HK 0.6246  0.176006
## X0836.HK 0.3940 -0.095643
## X0857.HK 0.7628  0.254282
## X0883.HK 0.8215  0.053884
## X0939.HK 0.8515 -0.010966
## X0941.HK 0.6017  0.435089
## X1044.HK 0.5155 -0.195903
## X1088.HK 0.8142  0.050440
## X1109.HK 0.7579 -0.336728
## X1199.HK 0.7736 -0.023336
## X1299.HK 0.6463 -0.005294
## X1398.HK 0.8836 -0.056232
## X1880.HK 0.6395 -0.130803
## X1898.HK 0.7770 -0.005532
## X2318.HK 0.8236 -0.113831
## X2388.HK 0.7967 -0.043094
## X2600.HK 0.7806 -0.085564
```

```
## X2628.HK 0.7788  0.031910
## X3328.HK 0.8585 -0.050894
## X3988.HK 0.8565  0.004009
```



5.2.2 Rotation : varimax

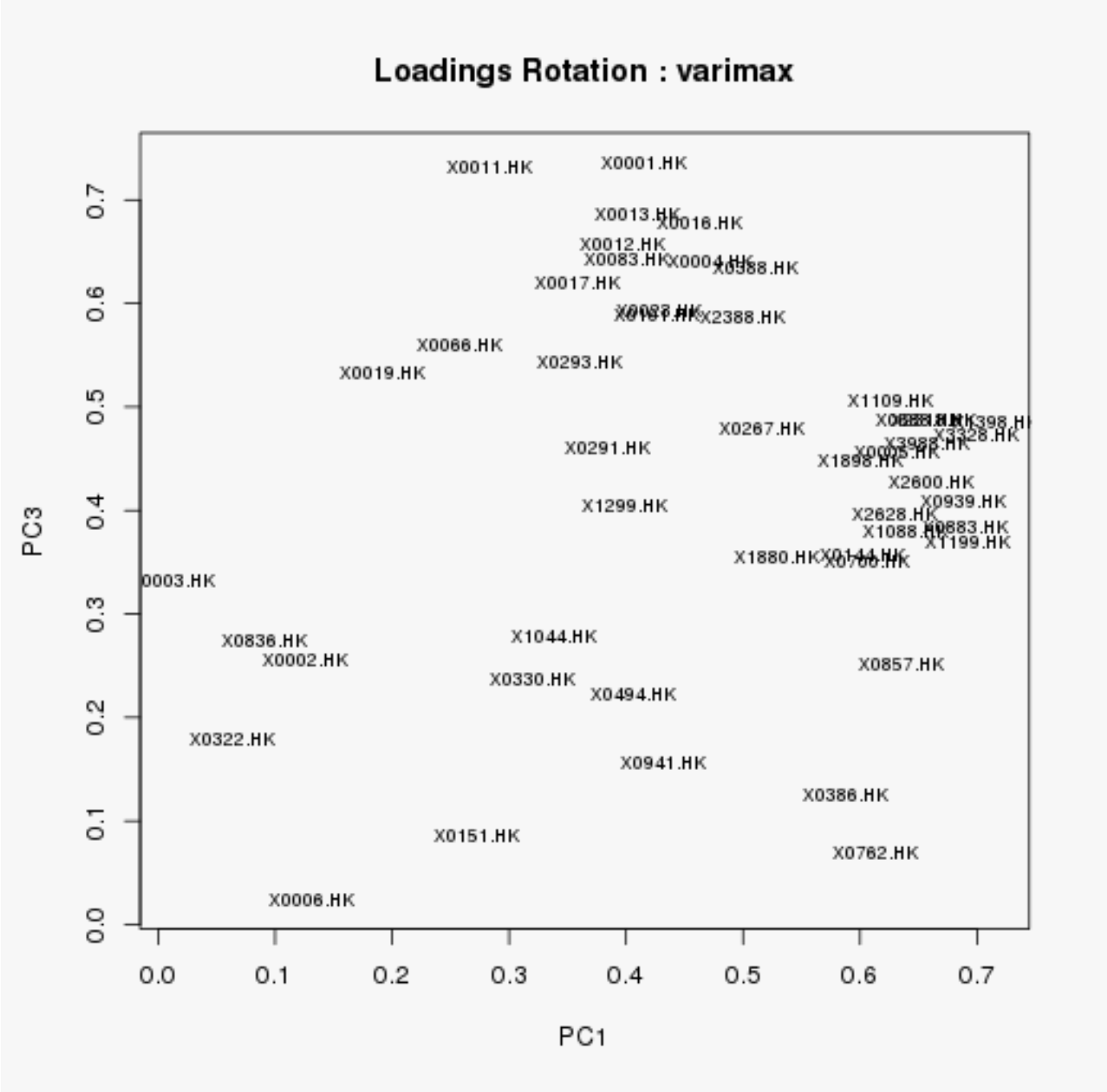
Varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix, which has the effect of differentiating the original variables by extracted factor. Each factor will tend to have either 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  PC3   PC2   PC4   PC5   h2   u2
## X1398.HK   40 0.72 0.49  0.16  0.18  0.08 0.81 0.19
## X3328.HK   47 0.70 0.47  0.14  0.11  0.15 0.77 0.23
## X1199.HK   38 0.69 0.37  0.14  0.03  0.18 0.66 0.34
## X0883.HK   32 0.69 0.38  0.24  0.14  0.11 0.71 0.29
## X0939.HK   33 0.69 0.41  0.20  0.23  0.14 0.75 0.25
## X2318.HK   43 0.66 0.49  0.08  0.15  0.08 0.71 0.29
## X2600.HK   45 0.66 0.43  0.10  0.12  0.08 0.65 0.35
## X3988.HK   48 0.66 0.46  0.21  0.18  0.14 0.75 0.25
## X0688.HK   27 0.65 0.49 -0.10  0.10  0.08 0.69 0.31
## X1088.HK   36 0.64 0.38  0.25  0.21  0.17 0.69 0.31
## X0857.HK   31 0.63 0.25  0.42  0.09  0.26 0.72 0.28
## X0005.HK    5 0.63 0.46  0.19  0.13  0.13 0.68 0.32
## X2628.HK   46 0.63 0.40  0.22  0.14  0.10 0.63 0.37
## X1109.HK   37 0.63 0.51 -0.15  0.12  0.16 0.71 0.29
## X0762.HK   29 0.61 0.07  0.33  0.22  0.17 0.57 0.43
## X0700.HK   28 0.61 0.35  0.08  0.22 -0.12 0.56 0.44
## X0144.HK   17 0.60 0.36  0.18  0.17  0.26 0.62 0.38
## X1898.HK   42 0.60 0.45  0.18  0.14  0.07 0.62 0.38
## X0386.HK   24 0.59 0.12  0.48  0.05  0.36 0.72 0.28
## X1880.HK   41 0.53 0.35  0.03  0.19  0.05 0.44 0.56
## X0267.HK   19 0.52 0.48  0.08  0.31  0.23 0.65 0.35
## X0494.HK   26 0.41 0.22  0.14  0.09 -0.01 0.24 0.76
## X0001.HK    1 0.42 0.74  0.21  0.13  0.16 0.80 0.20
## X0011.HK    7 0.28 0.73  0.21  0.20  0.07 0.70 0.30
## X0013.HK    9 0.41 0.69  0.16  0.15  0.15 0.71 0.29
## X0016.HK   10 0.46 0.68  0.25  0.10  0.15 0.77 0.23
## X0012.HK    8 0.40 0.66  0.23  0.11  0.21 0.70 0.30
## X0083.HK   15 0.40 0.64  0.17  0.02  0.19 0.64 0.36
## X0004.HK    4 0.47 0.64  0.08  0.12  0.12 0.67 0.33
## X0388.HK   25 0.51 0.63  0.15  0.19  0.11 0.73 0.27
## X0017.HK   11 0.36 0.62  0.11  0.04  0.24 0.58 0.42
## X0023.HK   13 0.43 0.59  0.23  0.23 -0.04 0.64 0.36
## X0101.HK   16 0.43 0.59  0.22  0.04  0.23 0.63 0.37
## X2388.HK   44 0.50 0.59  0.17  0.21  0.00 0.67 0.33
## X0066.HK   14 0.26 0.56  0.39  0.17  0.14 0.58 0.42
## X0293.HK   21 0.36 0.54 -0.01  0.19  0.13 0.48 0.52
## X0019.HK   12 0.19 0.53  0.17  0.33  0.16 0.49 0.51
## X0291.HK   20 0.38 0.46  0.13  0.12  0.15 0.41 0.59
## X1299.HK   39 0.40 0.40  0.17  0.17  0.22 0.43 0.57
## X0002.HK    2 0.13 0.26  0.77  0.06 -0.12 0.70 0.30
## X0006.HK    6 0.13 0.02  0.71 -0.17 -0.16 0.57 0.43
## X0003.HK    3 0.01 0.33  0.65  0.17  0.25 0.62 0.38
## X0941.HK   34 0.43 0.16  0.58  0.15  0.16 0.59 0.41
## X0322.HK   22 0.06 0.18  0.01  0.77  0.03 0.63 0.37
## X0151.HK   18 0.27 0.09  0.06  0.74  0.16 0.65 0.35
## X1044.HK   35 0.34 0.28  0.01  0.55 -0.08 0.50 0.50
```

```
## X0836.HK   30 0.09 0.27  0.01  0.05  0.77 0.68 0.32
## X0330.HK   23 0.32 0.24 -0.06  0.09  0.43 0.36 0.64
##
##                  PC1   PC3  PC2  PC4  PC5
## SS loadings    11.93 10.31 3.53 2.59 1.95
## Proportion Var  0.25  0.21 0.07 0.05 0.04
## Cumulative Var  0.25  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  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1

##               PC1     PC3
## X0001.HK 0.41539 0.73631
## X0002.HK 0.12575 0.25630
## X0003.HK 0.01284 0.33212
## X0004.HK 0.47176 0.64105
## X0005.HK 0.63240 0.45686
## X0006.HK 0.13189 0.02419
## X0011.HK 0.28418 0.73118
## X0012.HK 0.39728 0.65634
## X0013.HK 0.41064 0.68711
## X0016.HK 0.46303 0.67874
## X0017.HK 0.35889 0.61894
## X0019.HK 0.19246 0.53355
## X0023.HK 0.42754 0.59383
## X0066.HK 0.25697 0.55949
## X0083.HK 0.40072 0.64282
## X0101.HK 0.42644 0.58990
## X0144.HK 0.60233 0.35807
## X0151.HK 0.27172 0.08644
## X0267.HK 0.51606 0.47984
## X0291.HK 0.38414 0.46161
## X0293.HK 0.36076 0.54255
## X0322.HK 0.06392 0.17859
## X0330.HK 0.31965 0.23633
## X0386.HK 0.58800 0.12443
## X0388.HK 0.51045 0.63486
## X0494.HK 0.40681 0.22283
## X0688.HK 0.65064 0.48800
## X0700.HK 0.60639 0.35047
## X0762.HK 0.61372 0.06972
## X0836.HK 0.09111 0.27400
## X0857.HK 0.63471 0.25144
## X0883.HK 0.68980 0.38482
## X0939.HK 0.68890 0.40866
## X0941.HK 0.43171 0.15729
## X1044.HK 0.33891 0.27784
## X1088.HK 0.63870 0.38082
## X1109.HK 0.62662 0.50526
## X1199.HK 0.69110 0.37012
## X1299.HK 0.39886 0.40469
## X1398.HK 0.71652 0.48598
```

```
## X1880.HK 0.52851 0.35496
## X1898.HK 0.60103 0.44784
## X2318.HK 0.66309 0.48807
## X2388.HK 0.49947 0.58712
## X2600.HK 0.65990 0.42796
## X2628.HK 0.62942 0.39541
## X3328.HK 0.69978 0.47246
## X3988.HK 0.65694 0.46481
```



5.2.3 Rotation : quatimax

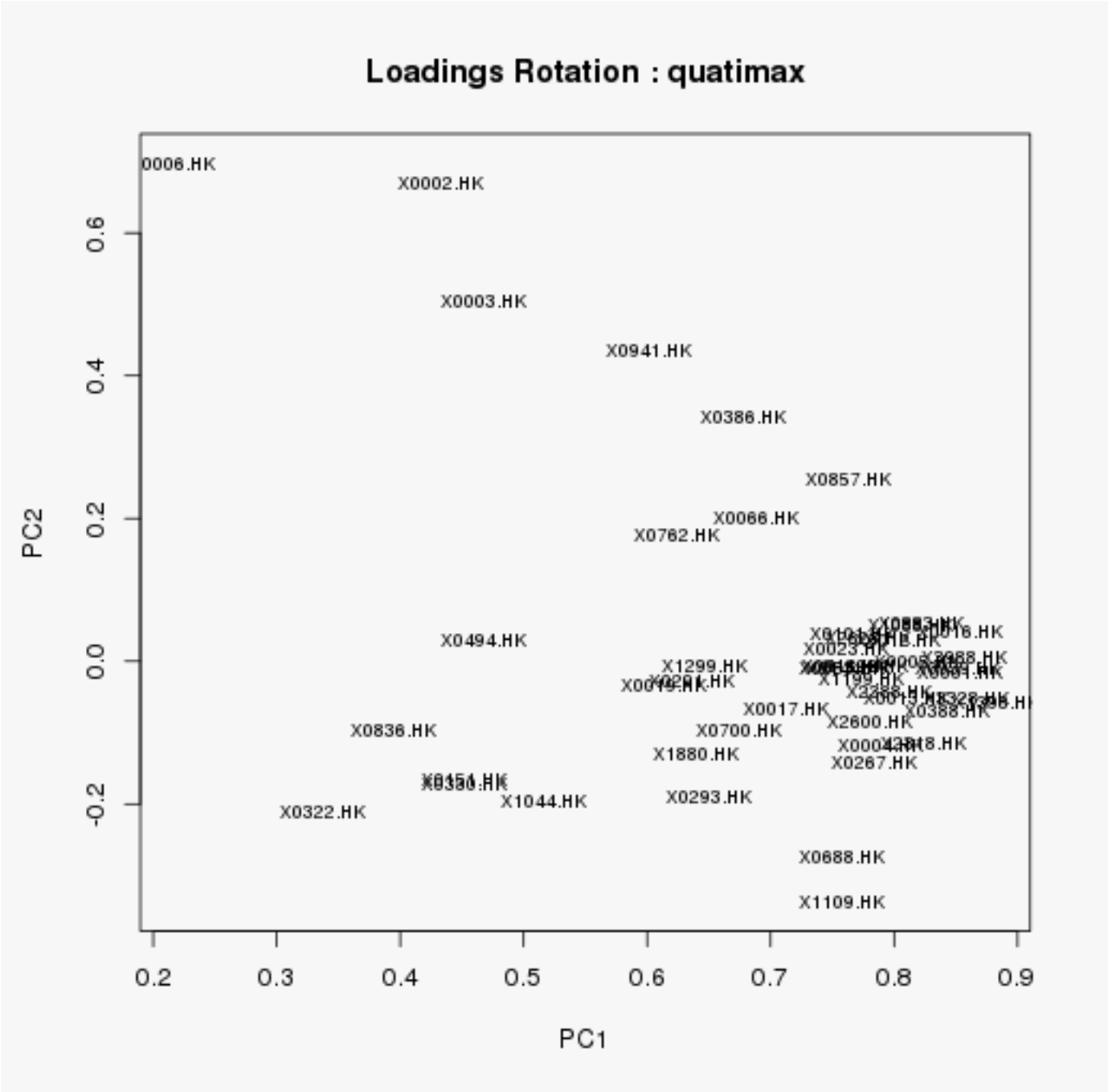
Quartimax rotation is an orthogonal alternative which minimizes the number of factors needed to explain each variable. This type of rotation often generates a general factor on which most variables are loaded to a high or medium degree. Such a factor structure is usually not helpful to the research purpose.

```
## 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 -0.06 -0.15  0.00 -0.06 0.81 0.19
## X3328.HK   47 0.86 -0.05 -0.15 -0.07  0.00 0.77 0.23
## X3988.HK   48 0.86  0.00 -0.11  0.01  0.00 0.75 0.25
## X0001.HK    1 0.85 -0.02  0.23 -0.12 -0.07 0.80 0.20
## X0016.HK   10 0.85  0.04  0.15 -0.12 -0.07 0.77 0.23
## X0939.HK   33 0.85 -0.01 -0.15  0.07  0.02 0.75 0.25
## X0388.HK   25 0.84 -0.07  0.09 -0.04 -0.09 0.73 0.27
## X2318.HK   43 0.82 -0.11 -0.13 -0.03 -0.07 0.71 0.29
## X0883.HK   32 0.82  0.05 -0.19  0.01 -0.01 0.71 0.29
## X0005.HK    5 0.82  0.00 -0.11 -0.03 -0.01 0.68 0.32
## X1088.HK   36 0.81  0.05 -0.13  0.07  0.06 0.69 0.31
## X0013.HK    9 0.81 -0.05  0.20 -0.09 -0.07 0.71 0.29
## X0012.HK    8 0.80  0.03  0.20 -0.12  0.00 0.70 0.30
## X2388.HK   44 0.80 -0.04  0.06  0.03 -0.17 0.67 0.33
## X0004.HK    4 0.79 -0.12  0.11 -0.11 -0.08 0.67 0.33
## X0267.HK   19 0.78 -0.14  0.04  0.09  0.09 0.65 0.35
## X2600.HK   45 0.78 -0.09 -0.17 -0.03 -0.06 0.65 0.35
## X2628.HK   46 0.78  0.03 -0.14  0.01 -0.02 0.63 0.37
## X1898.HK   42 0.78 -0.01 -0.10 -0.01 -0.07 0.62 0.38
## X1199.HK   38 0.77 -0.02 -0.23 -0.11  0.05 0.66 0.34
## X0101.HK   16 0.77  0.04  0.12 -0.17  0.03 0.63 0.37
## X0144.HK   17 0.76 -0.01 -0.12  0.01  0.14 0.62 0.38
## X0857.HK   31 0.76  0.25 -0.20  0.01  0.17 0.72 0.28
## X0023.HK   13 0.76  0.02  0.12  0.05 -0.21 0.64 0.36
## X0011.HK    7 0.76 -0.01  0.32 -0.04 -0.15 0.70 0.30
## X1109.HK   37 0.76 -0.34 -0.11 -0.11 -0.01 0.71 0.29
## X0688.HK   27 0.76 -0.27 -0.15 -0.10 -0.08 0.69 0.31
## X0083.HK   15 0.76 -0.01  0.16 -0.20 -0.02 0.64 0.36
## X0017.HK   11 0.71 -0.07  0.18 -0.19  0.03 0.58 0.42
## X0066.HK   14 0.69  0.20  0.26  0.00 -0.03 0.58 0.42
## X0386.HK   24 0.68  0.34 -0.23  0.01  0.30 0.72 0.28
## X0700.HK   28 0.67 -0.10 -0.19  0.12 -0.21 0.56 0.44
## X0293.HK   21 0.65 -0.19  0.14 -0.03 -0.03 0.48 0.52
## X1299.HK   39 0.65 -0.01  0.05  0.01  0.09 0.43 0.57
## X1880.HK   41 0.64 -0.13 -0.11  0.05 -0.06 0.44 0.56
## X0291.HK   20 0.64 -0.03  0.07 -0.06  0.00 0.41 0.59
## X0762.HK   29 0.62  0.18 -0.29  0.19  0.15 0.57 0.43
## X0019.HK   12 0.61 -0.03  0.31  0.12  0.01 0.49 0.51
## X0941.HK   34 0.60  0.44 -0.10  0.14  0.12 0.59 0.41
## X1044.HK   35 0.52 -0.20  0.04  0.43 -0.11 0.50 0.50
## X0494.HK   26 0.47  0.03 -0.13  0.03 -0.08 0.24 0.76
## X0330.HK   23 0.45 -0.17  0.00 -0.09  0.34 0.36 0.64
## X0006.HK    6 0.22  0.70 -0.08 -0.02 -0.17 0.57 0.43
## X0002.HK    2 0.43  0.67  0.13  0.11 -0.18 0.70 0.30
## X0003.HK    3 0.47  0.50  0.34  0.10  0.15 0.62 0.38
## X0322.HK   22 0.34 -0.21  0.25  0.64  0.04 0.63 0.37
## X0151.HK   18 0.45 -0.17  0.06  0.62  0.19 0.65 0.35
## X0836.HK   30 0.39 -0.10  0.25 -0.20  0.65 0.68 0.32
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.34 2.12 1.40 1.37 1.07
## Proportion Var  0.51 0.04 0.03 0.03 0.02
## Cumulative Var  0.51 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  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1
```

```
##              PC1       PC2
## X0001.HK 0.8533 -0.015495
## X0002.HK 0.4332  0.668768
## X0003.HK 0.4670  0.504749
## X0004.HK 0.7894 -0.117328
## X0005.HK 0.8182  0.000385
## X0006.HK 0.2163  0.697484
## X0011.HK 0.7595 -0.006928
## X0012.HK 0.8021  0.030353
## X0013.HK 0.8099 -0.053171
## X0016.HK 0.8528  0.041050
## X0017.HK 0.7119 -0.065676
## X0019.HK 0.6138 -0.032698
## X0023.HK 0.7610  0.017920
## X0066.HK 0.6889  0.201706
## X0083.HK 0.7570 -0.010474
## X0101.HK 0.7666  0.039556
## X0144.HK 0.7630 -0.010627
## X0151.HK 0.4513 -0.165083
## X0267.HK 0.7838 -0.141322
## X0291.HK 0.6367 -0.027487
## X0293.HK 0.6507 -0.189319
## X0322.HK 0.3367 -0.209706
## X0330.HK 0.4524 -0.171544
## X0386.HK 0.6785  0.342432
## X0388.HK 0.8429 -0.071203
## X0494.HK 0.4674  0.028424
## X0688.HK 0.7579 -0.272914
## X0700.HK 0.6744 -0.096131
## X0762.HK 0.6246  0.176006
## X0836.HK 0.3940 -0.095643
## X0857.HK 0.7628  0.254282
## X0883.HK 0.8215  0.053884
## X0939.HK 0.8515 -0.010966
## X0941.HK 0.6017  0.435089
## X1044.HK 0.5155 -0.195903
## X1088.HK 0.8142  0.050440
## X1109.HK 0.7579 -0.336728
## X1199.HK 0.7736 -0.023336
## X1299.HK 0.6463 -0.005294
## X1398.HK 0.8836 -0.056232
## X1880.HK 0.6395 -0.130803
## X1898.HK 0.7770 -0.005532
```

```
## X2318.HK 0.8236 -0.113831
## X2388.HK 0.7967 -0.043094
## X2600.HK 0.7806 -0.085564
## X2628.HK 0.7788  0.031910
## X3328.HK 0.8585 -0.050894
## X3988.HK 0.8565  0.004009
```



5.2.4 Rotation : simplimax

A compromise between Varimax and Quartimax criteria.

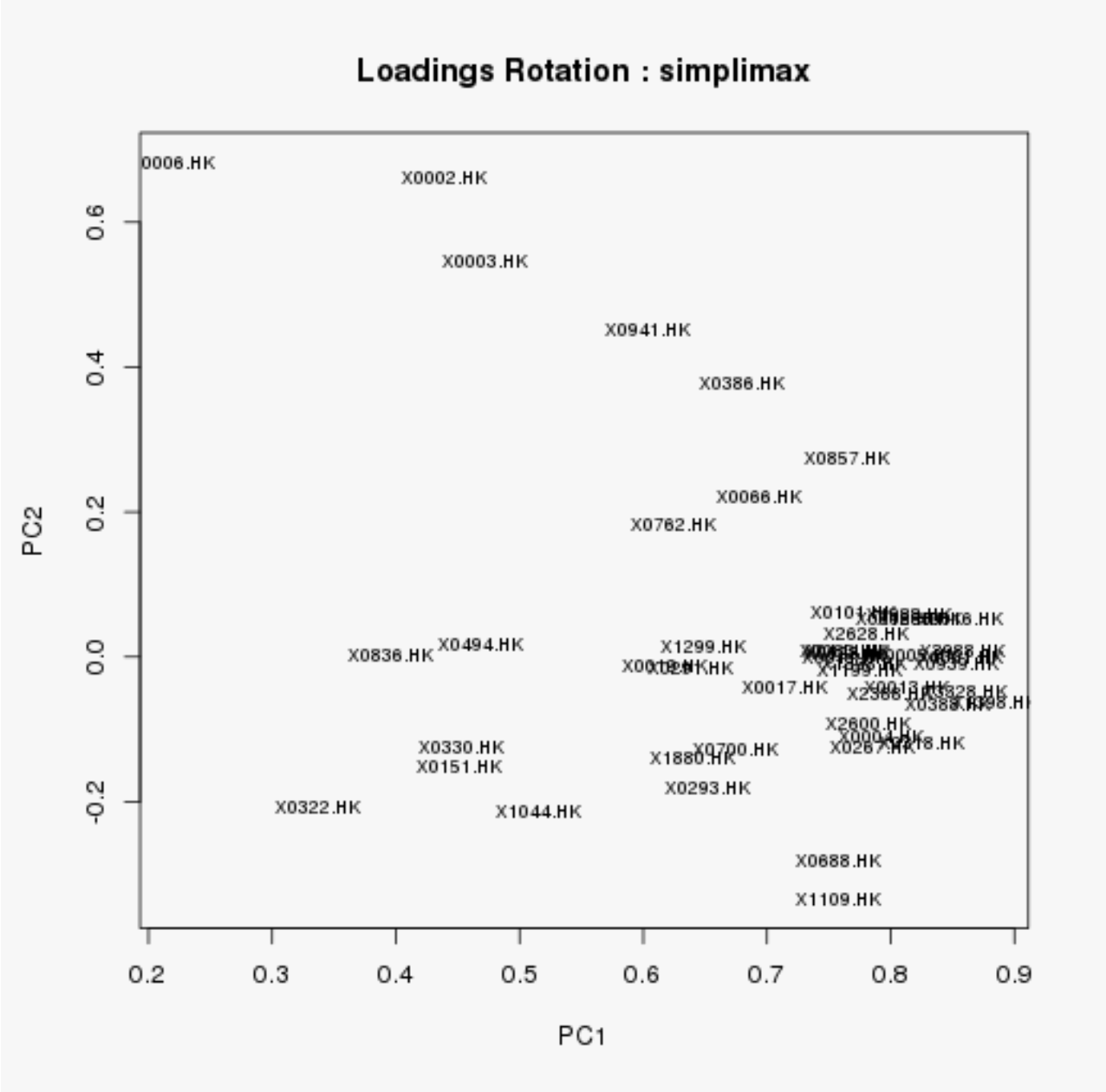
```
## Warning message: convergence not obtained in GPFoblq. 1000 iterations used.

## 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  0.21  0.00 -0.06 0.81 0.19
## X3328.HK   47 0.86 -0.05  0.21 -0.07  0.00 0.77 0.23
## X3988.HK   48 0.86  0.01  0.17  0.01  0.00 0.75 0.25
## X0001.HK    1 0.86  0.00 -0.17 -0.09 -0.06 0.80 0.20
## X0016.HK   10 0.86  0.05 -0.09 -0.09 -0.05 0.77 0.23
## X0939.HK   33 0.85 -0.01  0.22  0.06  0.02 0.75 0.25
## X0388.HK   25 0.85 -0.07 -0.04 -0.01 -0.08 0.73 0.27
## X2318.HK   43 0.82 -0.12  0.17 -0.04 -0.07 0.71 0.29
## X0883.HK   32 0.82  0.05  0.26  0.00  0.00 0.71 0.29
## X0005.HK    5 0.82  0.00  0.17 -0.03  0.00 0.68 0.32
## X1088.HK   36 0.82  0.06  0.20  0.06  0.06 0.69 0.31
## X0013.HK    9 0.81 -0.04 -0.15 -0.06 -0.06 0.71 0.29
## X0012.HK    8 0.81  0.05 -0.14 -0.09  0.01 0.70 0.30
## X2388.HK   44 0.80 -0.05 -0.01  0.05 -0.17 0.67 0.33
## X0004.HK    4 0.79 -0.11 -0.07 -0.09 -0.08 0.67 0.33
## X0267.HK   19 0.79 -0.12  0.01  0.09  0.09 0.65 0.35
## X2600.HK   45 0.78 -0.09  0.21 -0.04 -0.05 0.65 0.35
## X2628.HK   46 0.78  0.03  0.21  0.00 -0.02 0.63 0.37
## X1898.HK   42 0.78 -0.01  0.16 -0.01 -0.06 0.62 0.38
## X1199.HK   38 0.77 -0.02  0.27 -0.13  0.06 0.66 0.34
## X0101.HK   16 0.77  0.06 -0.07 -0.15  0.05 0.63 0.37
## X0857.HK   31 0.76  0.27  0.29  0.00  0.19 0.72 0.28
## X0144.HK   17 0.76  0.01  0.17  0.00  0.14 0.62 0.38
## X0023.HK   13 0.76  0.01 -0.05  0.08 -0.21 0.64 0.36
## X0011.HK    7 0.76  0.00 -0.26  0.01 -0.14 0.70 0.30
## X0083.HK   15 0.76  0.01 -0.12 -0.18 -0.01 0.64 0.36
## X0688.HK   27 0.76 -0.28  0.16 -0.11 -0.08 0.69 0.31
## X1109.HK   37 0.76 -0.33  0.11 -0.12 -0.01 0.71 0.29
## X0017.HK   11 0.71 -0.04 -0.15 -0.17  0.04 0.58 0.42
## X0066.HK   14 0.69  0.22 -0.18  0.05 -0.01 0.58 0.42
## X0386.HK   24 0.68  0.38  0.33 -0.01  0.32 0.72 0.28
## X0700.HK   28 0.67 -0.13  0.23  0.11 -0.22 0.56 0.44
## X0293.HK   21 0.65 -0.18 -0.12 -0.01 -0.03 0.48 0.52
## X1299.HK   39 0.65  0.02  0.00  0.02  0.10 0.43 0.57
## X1880.HK   41 0.64 -0.14  0.14  0.04 -0.06 0.44 0.56
## X0291.HK   20 0.64 -0.02 -0.03 -0.04  0.01 0.41 0.59
## X0762.HK   29 0.62  0.18  0.38  0.17  0.15 0.57 0.43
## X0019.HK   12 0.62 -0.01 -0.26  0.16  0.01 0.49 0.51
## X0941.HK   34 0.60  0.45  0.21  0.14  0.13 0.59 0.41
## X1044.HK   35 0.52 -0.21  0.00  0.43 -0.15 0.50 0.50
## X0494.HK   26 0.47  0.02  0.17  0.03 -0.08 0.24 0.76
## X0330.HK   23 0.45 -0.13  0.00 -0.10  0.35 0.36 0.64
## X0006.HK    6 0.22  0.68  0.19  0.00 -0.14 0.57 0.43
## X0002.HK    2 0.44  0.66  0.00  0.16 -0.16 0.70 0.30
## X0003.HK    3 0.47  0.55 -0.22  0.15  0.17 0.62 0.38
## X0322.HK   22 0.34 -0.21 -0.20  0.66  0.00 0.63 0.37
## X0151.HK   18 0.45 -0.15  0.00  0.62  0.16 0.65 0.35
## X0836.HK   30 0.40  0.00 -0.24 -0.19  0.67 0.68 0.32
```

```
##
##                  PC1  PC2  PC3  PC4  PC5
## SS loadings    24.33 2.12 1.42 1.38 1.07
## Proportion Var  0.51 0.04 0.03 0.03 0.02
## Cumulative Var  0.51 0.55 0.58 0.61 0.63
##
##  With component correlations of
##       PC1   PC2   PC3   PC4   PC5
## PC1  1.00 -0.01 -0.07 -0.01  0.00
## PC2 -0.01  1.00 -0.09 -0.02 -0.16
## PC3 -0.07 -0.09  1.00  0.03  0.02
## PC4 -0.01 -0.02  0.03  1.00  0.09
## PC5  0.00 -0.16  0.02  0.09  1.00
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are  1128  and the objective function was  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1

##             PC1       PC2
## X0001.HK 0.8570 -0.000150
## X0002.HK 0.4382  0.661048
## X0003.HK 0.4723  0.545688
## X0004.HK 0.7918 -0.111194
## X0005.HK 0.8197  0.003757
## X0006.HK 0.2198  0.682749
## X0011.HK 0.7635  0.000708
## X0012.HK 0.8057  0.051889
## X0013.HK 0.8132 -0.040483
## X0016.HK 0.8564  0.053783
## X0017.HK 0.7148 -0.040667
## X0019.HK 0.6169 -0.012550
## X0023.HK 0.7638  0.006300
## X0066.HK 0.6932  0.220483
## X0083.HK 0.7603  0.008414
## X0101.HK 0.7698  0.062887
## X0144.HK 0.7640  0.008048
## X0151.HK 0.4507 -0.152185
## X0267.HK 0.7851 -0.123614
## X0291.HK 0.6388 -0.015438
## X0293.HK 0.6524 -0.179810
## X0322.HK 0.3368 -0.207952
## X0330.HK 0.4526 -0.125451
## X0386.HK 0.6801  0.376527
## X0388.HK 0.8455 -0.066904
## X0494.HK 0.4680  0.017825
## X0688.HK 0.7580 -0.280681
## X0700.HK 0.6745 -0.126639
## X0762.HK 0.6248  0.182765
## X0836.HK 0.3958  0.001232
## X0857.HK 0.7645  0.274942
## X0883.HK 0.8227  0.052959
## X0939.HK 0.8525 -0.008409
## X0941.HK 0.6043  0.450375
```

```
## X1044.HK 0.5154 -0.214543
## X1088.HK 0.8156  0.058297
## X1109.HK 0.7579 -0.333934
## X1199.HK 0.7743 -0.017592
## X1299.HK 0.6482  0.015123
## X1398.HK 0.8847 -0.062125
## X1880.HK 0.6399 -0.138130
## X1898.HK 0.7784 -0.009613
## X2318.HK 0.8245 -0.119259
## X2388.HK 0.7990 -0.051701
## X2600.HK 0.7813 -0.091492
## X2628.HK 0.7801  0.031028
## X3328.HK 0.8596 -0.047915
## X3988.HK 0.8580  0.007459
```


Loadings Rotation : simplimax
0006.HK
X0002.HK
X0003.HK
X0941.HK
X0386.HK
X0857.HK
X0066.HK
X0762.HK
X0494.HK
X0836.HK
X1299.HK
X2628.HK
X0017.HK
X2600.HK
X0330.HK
X0151.HK
X0322.HK
X1044.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

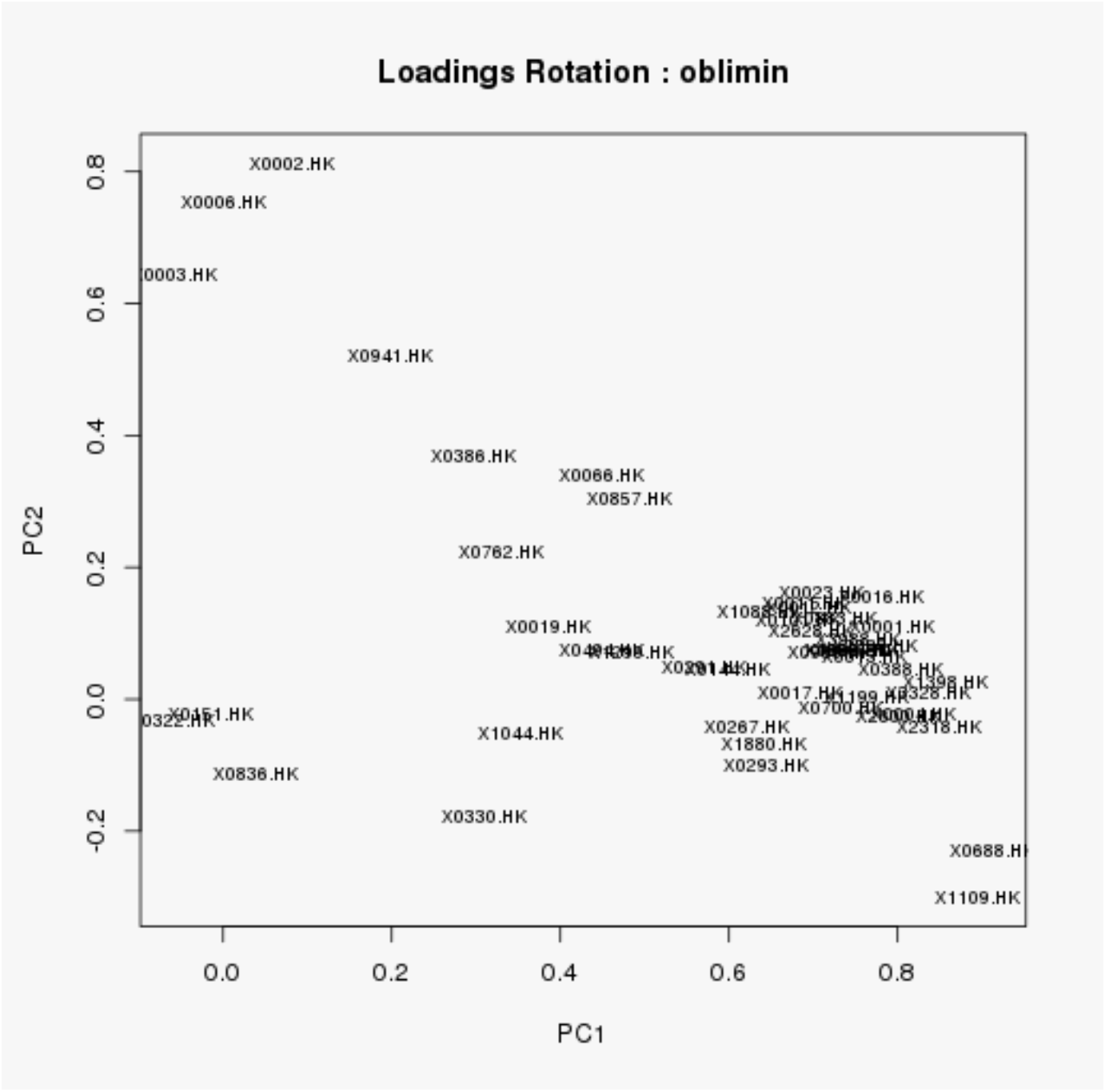
Direct oblimin rotation is the standard method when one wishes a non-orthogonal (oblique) solution – that is, one in which the factors are allowed to be correlated. This will result in higher eigenvalues but diminished interpretability of the factors.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "oblimin")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item   PC1   PC2   PC4   PC5   PC3   h2   u2
## X0688.HK   27  0.91 -0.23 -0.03 -0.05  0.05 0.69 0.31
## X1109.HK   37  0.89 -0.30 -0.01  0.04  0.04 0.71 0.29
## X1398.HK   40  0.86  0.03  0.05 -0.05  0.13 0.81 0.19
## X2318.HK   43  0.85 -0.04  0.02 -0.04  0.08 0.71 0.29
## X3328.HK   47  0.84  0.01 -0.01  0.03  0.14 0.77 0.23
## X0004.HK    4  0.82 -0.02 -0.01  0.05 -0.14 0.67 0.33
## X0388.HK   25  0.80  0.04  0.07  0.03 -0.11 0.73 0.27
## X2600.HK   45  0.80 -0.03  0.01 -0.05  0.13 0.65 0.35
## X0001.HK    1  0.79  0.11  0.00  0.11 -0.22 0.80 0.20
## X0016.HK   10  0.78  0.16 -0.02  0.09 -0.15 0.77 0.23
## X2388.HK   44  0.77  0.08  0.10 -0.09 -0.11 0.67 0.33
## X1199.HK   38  0.76  0.00 -0.08  0.06  0.22 0.66 0.34
## X0013.HK    9  0.76  0.07  0.03  0.09 -0.20 0.71 0.29
## X3988.HK   48  0.75  0.09  0.07  0.02  0.12 0.75 0.25
## X0005.HK    5  0.75  0.07  0.02  0.03  0.11 0.68 0.32
## X0083.HK   15  0.74  0.07 -0.10  0.15 -0.16 0.64 0.36
## X1898.HK   42  0.74  0.07  0.03 -0.04  0.08 0.62 0.38
## X0700.HK   28  0.73 -0.01  0.12 -0.26  0.10 0.56 0.44
## X0883.HK   32  0.73  0.12  0.03 -0.01  0.20 0.71 0.29
## X0939.HK   33  0.72  0.07  0.13  0.02  0.18 0.75 0.25
## X0023.HK   13  0.71  0.16  0.12 -0.12 -0.16 0.64 0.36
## X2628.HK   46  0.70  0.10  0.04 -0.01  0.15 0.63 0.37
## X0012.HK    8  0.69  0.14  0.00  0.17 -0.16 0.70 0.30
## X0011.HK    7  0.69  0.15  0.08  0.04 -0.33 0.70 0.30
## X0017.HK   11  0.68  0.01 -0.07  0.20 -0.16 0.58 0.42
## X0101.HK   16  0.68  0.12 -0.07  0.19 -0.09 0.63 0.37
## X0293.HK   21  0.64 -0.10  0.10  0.07 -0.15 0.48 0.52
## X1880.HK   41  0.64 -0.07  0.10 -0.06  0.08 0.44 0.56
## X1088.HK   36  0.64  0.13  0.12  0.06  0.19 0.69 0.31
## X0267.HK   19  0.62 -0.04  0.23  0.14  0.03 0.65 0.35
## X0144.HK   17  0.60  0.05  0.09  0.16  0.19 0.62 0.38
## X0291.HK   20  0.57  0.05  0.03  0.09 -0.05 0.41 0.59
## X1299.HK   39  0.48  0.07  0.11  0.16  0.02 0.43 0.57
## X0857.HK   31  0.48  0.30  0.02  0.17  0.33 0.72 0.28
## X0494.HK   26  0.45  0.08  0.03 -0.09  0.10 0.24 0.76
## X0066.HK   14  0.45  0.34  0.10  0.13 -0.18 0.58 0.42
## X0019.HK   12  0.39  0.11  0.28  0.14 -0.22 0.49 0.51
## X0002.HK    2  0.08  0.81  0.04 -0.11 -0.05 0.70 0.30
## X0006.HK    6  0.00  0.76 -0.18 -0.15  0.11 0.57 0.43
## X0003.HK    3 -0.06  0.64  0.18  0.30 -0.11 0.62 0.38
## X0941.HK   34  0.20  0.52  0.12  0.10  0.26 0.59 0.41
## X0322.HK   22 -0.06 -0.03  0.82 -0.02 -0.11 0.63 0.37
## X0151.HK   18 -0.02 -0.02  0.79  0.09  0.13 0.65 0.35
## X1044.HK   35  0.35 -0.05  0.52 -0.17 -0.03 0.50 0.50
## X0836.HK   30  0.04 -0.11  0.05  0.82  0.05 0.68 0.32
## X0330.HK   23  0.31 -0.18  0.05  0.40  0.13 0.36 0.64
## X0386.HK   24  0.30  0.37  0.02  0.28  0.42 0.72 0.28
## X0762.HK   29  0.33  0.22  0.19  0.05  0.41 0.57 0.43
```

```
##
##                  PC1  PC2  PC4  PC5  PC3
## SS loadings    20.81 3.34 2.63 2.02 1.49
## Proportion Var  0.43 0.07 0.05 0.04 0.03
## Cumulative Var  0.43 0.50 0.56 0.60 0.63
##
##  With component correlations of
##      PC1  PC2  PC4   PC5   PC3
## PC1 1.00 0.39 0.46  0.40  0.14
## PC2 0.39 1.00 0.16  0.19  0.04
## PC4 0.46 0.16 1.00  0.17  0.04
## PC5 0.40 0.19 0.17  1.00 -0.04
## PC3 0.14 0.04 0.04 -0.04  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  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1

##                PC1       PC2
## X0001.HK  0.793010  0.110562
## X0002.HK  0.081926  0.812762
## X0003.HK -0.057999  0.643287
## X0004.HK  0.817767 -0.022013
## X0005.HK  0.749366  0.074227
## X0006.HK  0.001349  0.755085
## X0011.HK  0.688175  0.146410
## X0012.HK  0.694924  0.140246
## X0013.HK  0.760583  0.066099
## X0016.HK  0.781638  0.156379
## X0017.HK  0.684582  0.010053
## X0019.HK  0.386381  0.111658
## X0023.HK  0.710770  0.160649
## X0066.HK  0.447935  0.340755
## X0083.HK  0.740138  0.073324
## X0101.HK  0.681356  0.120736
## X0144.HK  0.598180  0.045087
## X0151.HK -0.015047 -0.023496
## X0267.HK  0.622138 -0.043279
## X0291.HK  0.570650  0.048332
## X0293.HK  0.644104 -0.098982
## X0322.HK -0.059159 -0.030909
## X0330.HK  0.310615 -0.177141
## X0386.HK  0.297221  0.367561
## X0388.HK  0.802784  0.044181
## X0494.HK  0.448454  0.075723
## X0688.HK  0.913304 -0.230475
## X0700.HK  0.731763 -0.012288
## X0762.HK  0.328589  0.223712
## X0836.HK  0.038770 -0.112072
## X0857.HK  0.481155  0.303523
## X0883.HK  0.725560  0.122180
## X0939.HK  0.719449  0.071734
## X0941.HK  0.196990  0.519747
```

```
## X1044.HK  0.351959 -0.052535
## X1088.HK  0.635828  0.131743
## X1109.HK  0.894399 -0.300031
## X1199.HK  0.764109  0.003177
## X1299.HK  0.483279  0.071121
## X1398.HK  0.857174  0.026002
## X1880.HK  0.641282 -0.066748
## X1898.HK  0.738954  0.073676
## X2318.HK  0.848407 -0.042176
## X2388.HK  0.772291  0.081660
## X2600.HK  0.801078 -0.026423
## X2628.HK  0.696543  0.103512
## X3328.HK  0.836357  0.009619
## X3988.HK  0.752741  0.089348
```


Loadings Rotation : oblimin
X0002.HK
X0006.HK
0003.HK
X0941.HK
X0386.HK
X0066.HK
X0857.HK
X0762.HK
X0019.HK
X0388.HK
X0017.HK
X0151.HK
X1044.HK
X0267.HK
X1880.HK
X0293.HK
X0836.HK
X0330.HK
X0688.H
X1109.HK
X2318.HK
PC1
PC2
0.0
0.2
0.4
0.6
0.8
-0.2
0.0
0.2
0.4
0.6
0.8

5.2.6 Rotation : promax

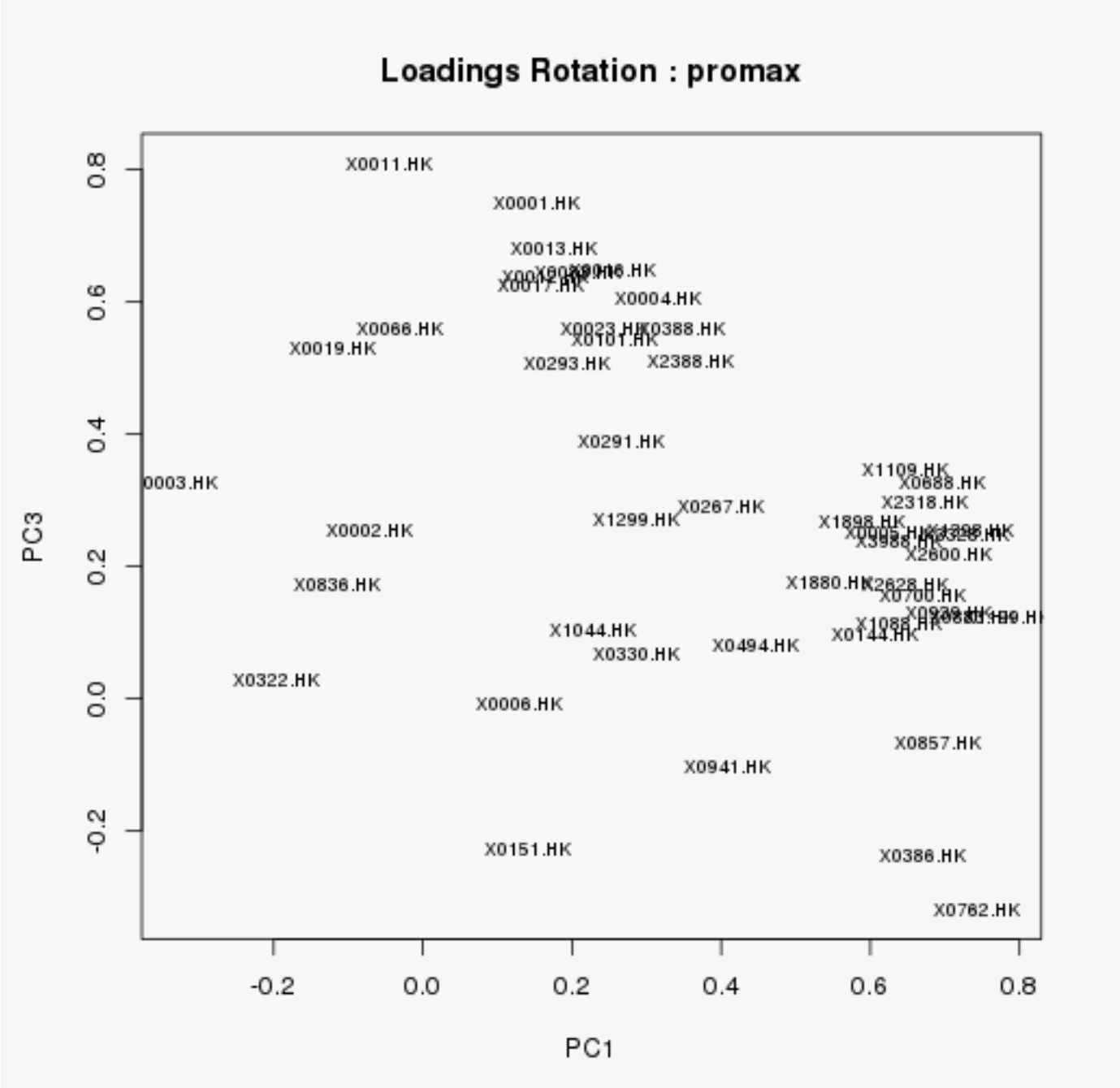
Promax rotation is an alternative non-orthogonal (oblique) rotation method which is computationally faster than the direct oblimin method and therefore is sometimes used for very large datasets.

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "promax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##          item   PC1   PC3   PC2   PC4   PC5   h2   u2
## X1199.HK   38  0.78  0.12 -0.04 -0.14  0.04 0.66 0.34
## X0762.HK   29  0.74 -0.32  0.20  0.16  0.04 0.57 0.43
## X0883.HK   32  0.74  0.12  0.09 -0.02 -0.04 0.71 0.29
## X1398.HK   40  0.73  0.25 -0.01  0.00 -0.08 0.81 0.19
## X3328.HK   47  0.73  0.25 -0.03 -0.07  0.00 0.77 0.23
## X0939.HK   33  0.70  0.13  0.04  0.09 -0.01 0.75 0.25
## X2600.HK   45  0.70  0.22 -0.06 -0.04 -0.07 0.65 0.35
## X0688.HK   27  0.70  0.33 -0.27 -0.07 -0.06 0.69 0.31
## X0857.HK   31  0.69 -0.07  0.27 -0.04  0.14 0.72 0.28
## X2318.HK   43  0.67  0.29 -0.08 -0.02 -0.07 0.71 0.29
## X0386.HK   24  0.67 -0.24  0.33 -0.04  0.26 0.72 0.28
## X0700.HK   28  0.67  0.15 -0.03  0.09 -0.28 0.56 0.44
## X2628.HK   46  0.65  0.17  0.07 -0.01 -0.04 0.63 0.37
## X1109.HK   37  0.65  0.34 -0.34 -0.04  0.04 0.71 0.29
## X3988.HK   48  0.64  0.24  0.05  0.03 -0.01 0.75 0.25
## X1088.HK   36  0.64  0.11  0.10  0.08  0.03 0.69 0.31
## X0005.HK    5  0.62  0.25  0.04 -0.03  0.00 0.68 0.32
## X0144.HK   17  0.61  0.10  0.00  0.04  0.14 0.62 0.38
## X1898.HK   42  0.59  0.27  0.04 -0.01 -0.07 0.62 0.38
## X1880.HK   41  0.54  0.18 -0.09  0.08 -0.07 0.44 0.56
## X0494.HK   26  0.45  0.08  0.06  0.00 -0.11 0.24 0.76
## X0267.HK   19  0.40  0.29 -0.08  0.20  0.13 0.65 0.35
## X1299.HK   39  0.29  0.27  0.04  0.07  0.14 0.43 0.57
## X0011.HK    7 -0.04  0.81  0.12  0.05 -0.03 0.70 0.30
## X0001.HK    1  0.15  0.75  0.08 -0.04  0.05 0.80 0.20
## X0013.HK    9  0.18  0.68  0.03 -0.01  0.04 0.71 0.29
## X0016.HK   10  0.25  0.65  0.12 -0.08  0.03 0.77 0.23
## X0083.HK   15  0.21  0.65  0.04 -0.15  0.10 0.64 0.36
## X0012.HK    8  0.16  0.64  0.10 -0.05  0.11 0.70 0.30
## X0017.HK   11  0.16  0.62 -0.03 -0.12  0.17 0.58 0.42
## X0004.HK    4  0.31  0.61 -0.06 -0.05  0.00 0.67 0.33
## X0066.HK   14 -0.03  0.56  0.32  0.06  0.06 0.58 0.42
## X0388.HK   25  0.35  0.56  0.01  0.03 -0.02 0.73 0.27
## X0023.HK   13  0.24  0.56  0.14  0.09 -0.18 0.64 0.36
## X0101.HK   16  0.26  0.54  0.08 -0.12  0.14 0.63 0.37
## X0019.HK   12 -0.12  0.53  0.09  0.27  0.10 0.49 0.51
## X2388.HK   44  0.36  0.51  0.06  0.06 -0.14 0.67 0.33
## X0293.HK   21  0.19  0.51 -0.13  0.08  0.05 0.48 0.52
## X0291.HK   20  0.26  0.39  0.02 -0.01  0.06 0.41 0.59
## X0002.HK    2 -0.07  0.25  0.83  0.00 -0.22 0.70 0.30
## X0006.HK    6  0.13 -0.01  0.77 -0.23 -0.24 0.57 0.43
## X0003.HK    3 -0.33  0.32  0.63  0.14  0.22 0.62 0.38
## X0941.HK   34  0.41 -0.10  0.50  0.08  0.05 0.59 0.41
## X0322.HK   22 -0.20  0.03 -0.04  0.88 -0.02 0.63 0.37
## X0151.HK   18  0.14 -0.23 -0.04  0.82  0.10 0.65 0.35
## X1044.HK   35  0.23  0.10 -0.06  0.55 -0.19 0.50 0.50
## X0836.HK   30 -0.12  0.17 -0.18  0.01  0.84 0.68 0.32
## X0330.HK   23  0.29  0.07 -0.22  0.03  0.42 0.36 0.64
##
```

```
##                   PC1   PC3  PC2  PC4  PC5
## SS loadings    13.65 10.18 2.88 2.07 1.53
## Proportion Var  0.28  0.21 0.06 0.04 0.03
## Cumulative Var  0.28  0.50 0.56 0.60 0.63
##
##  With component correlations of
##      PC1  PC3  PC2  PC4  PC5
## PC1 1.00 0.73 0.41 0.53 0.45
## PC3 0.73 1.00 0.31 0.53 0.40
## PC2 0.41 0.31 1.00 0.22 0.35
## PC4 0.53 0.53 0.22 1.00 0.25
## PC5 0.45 0.40 0.35 0.25 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  41.88 0.3
## The degrees of freedom for the model are 898  and the objective function was  6.63
##  0.3The number of observations was  291  with Chi Square =  1788  with prob <  1.8e-61
##  0.3
## Fit based upon off diagonal values = 1
```

```
##                PC1       PC3
## X0001.HK  0.15362  0.747377
## X0002.HK -0.07224  0.253420
## X0003.HK -0.33204  0.324806
## X0004.HK  0.31489  0.605372
## X0005.HK  0.62275  0.251837
## X0006.HK  0.12911 -0.008452
## X0011.HK -0.04393  0.808602
## X0012.HK  0.16265  0.638410
## X0013.HK  0.17550  0.681557
## X0016.HK  0.25469  0.648662
## X0017.HK  0.15819  0.623085
## X0019.HK -0.12012  0.527832
## X0023.HK  0.24217  0.557802
## X0066.HK -0.03007  0.560007
## X0083.HK  0.20911  0.645595
## X0101.HK  0.25571  0.542328
## X0144.HK  0.60683  0.096314
## X0151.HK  0.14096 -0.229807
## X0267.HK  0.39987  0.288286
## X0291.HK  0.26447  0.388431
## X0293.HK  0.19358  0.507438
## X0322.HK -0.19717  0.026550
## X0330.HK  0.28547  0.066327
## X0386.HK  0.67045 -0.237964
## X0388.HK  0.34769  0.557895
## X0494.HK  0.44605  0.080081
## X0688.HK  0.69710  0.325185
## X0700.HK  0.66885  0.154773
## X0762.HK  0.74316 -0.319412
## X0836.HK -0.11648  0.171251
## X0857.HK  0.68909 -0.067504
## X0883.HK  0.73807  0.121789
## X0939.HK  0.70476  0.130782
## X0941.HK  0.40700 -0.102877
## X1044.HK  0.22931  0.102158
```

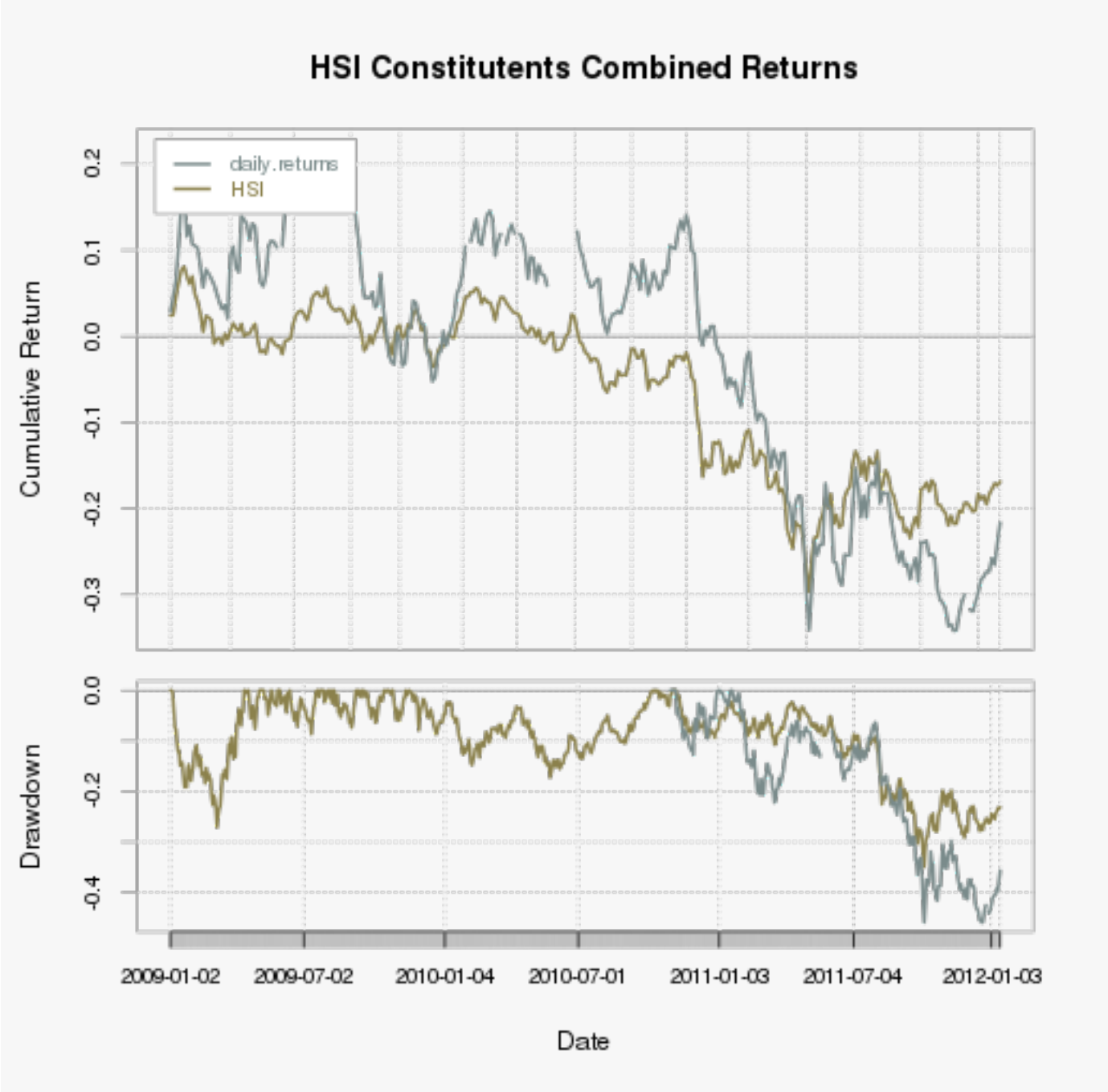
```
## X1088.HK  0.63716  0.112353
## X1109.HK  0.64678  0.344089
## X1199.HK  0.78460  0.121115
## X1299.HK  0.28596  0.270521
## X1398.HK  0.73463  0.253119
## X1880.HK  0.54378  0.175922
## X1898.HK  0.58960  0.267292
## X2318.HK  0.67347  0.294775
## X2388.HK  0.35922  0.509885
## X2600.HK  0.70432  0.217996
## X2628.HK  0.64820  0.170325
## X3328.HK  0.72717  0.245999
## X3988.HK  0.63912  0.236902
```



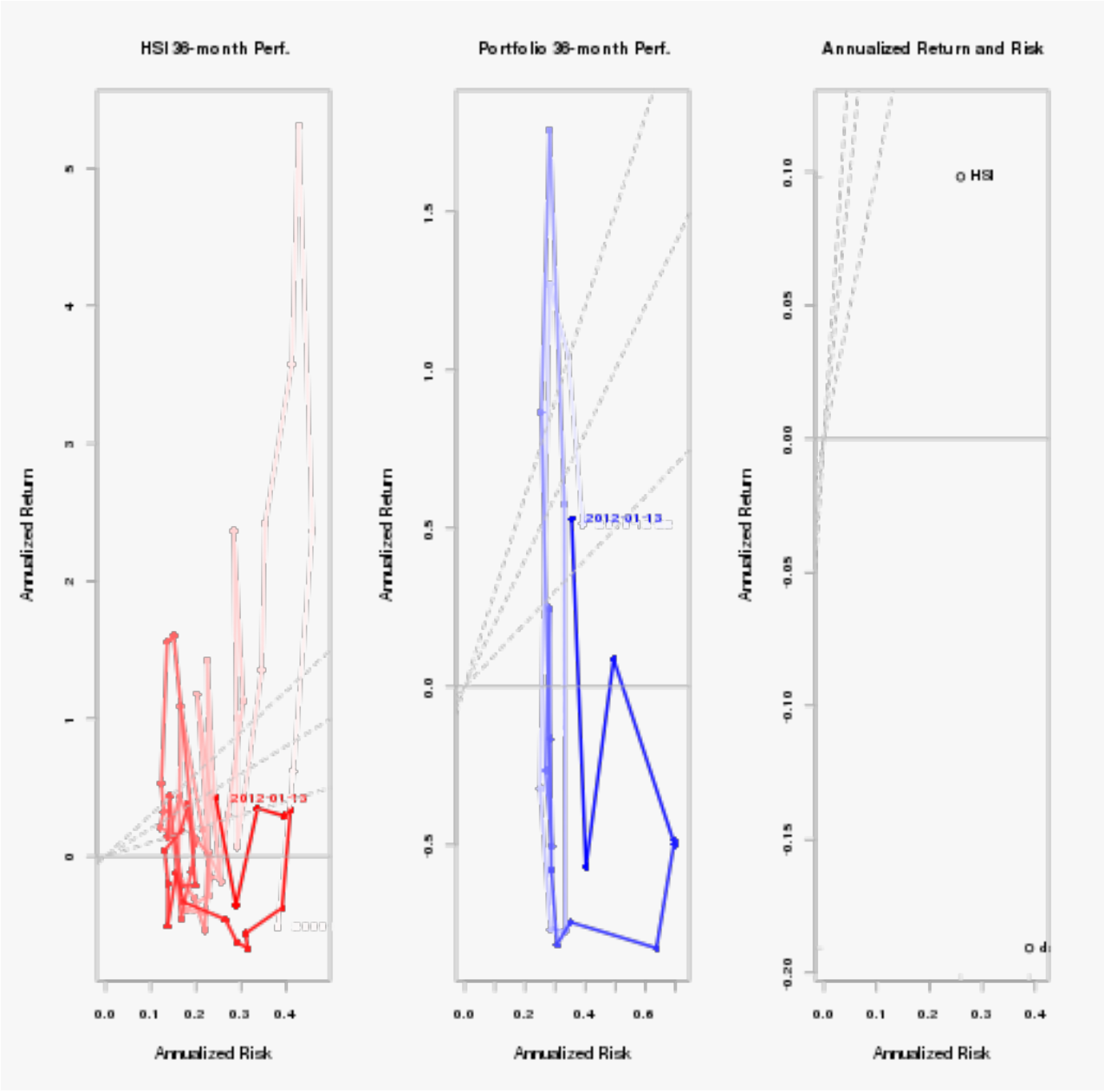
PCA is a science in itself and can not be fully covered and even less interpreted in this paper. The factors produced by principal component analysis are conceptualized as being linear combinations of the variables whereas the factors produced by common factor analysis are conceptualized as being latent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

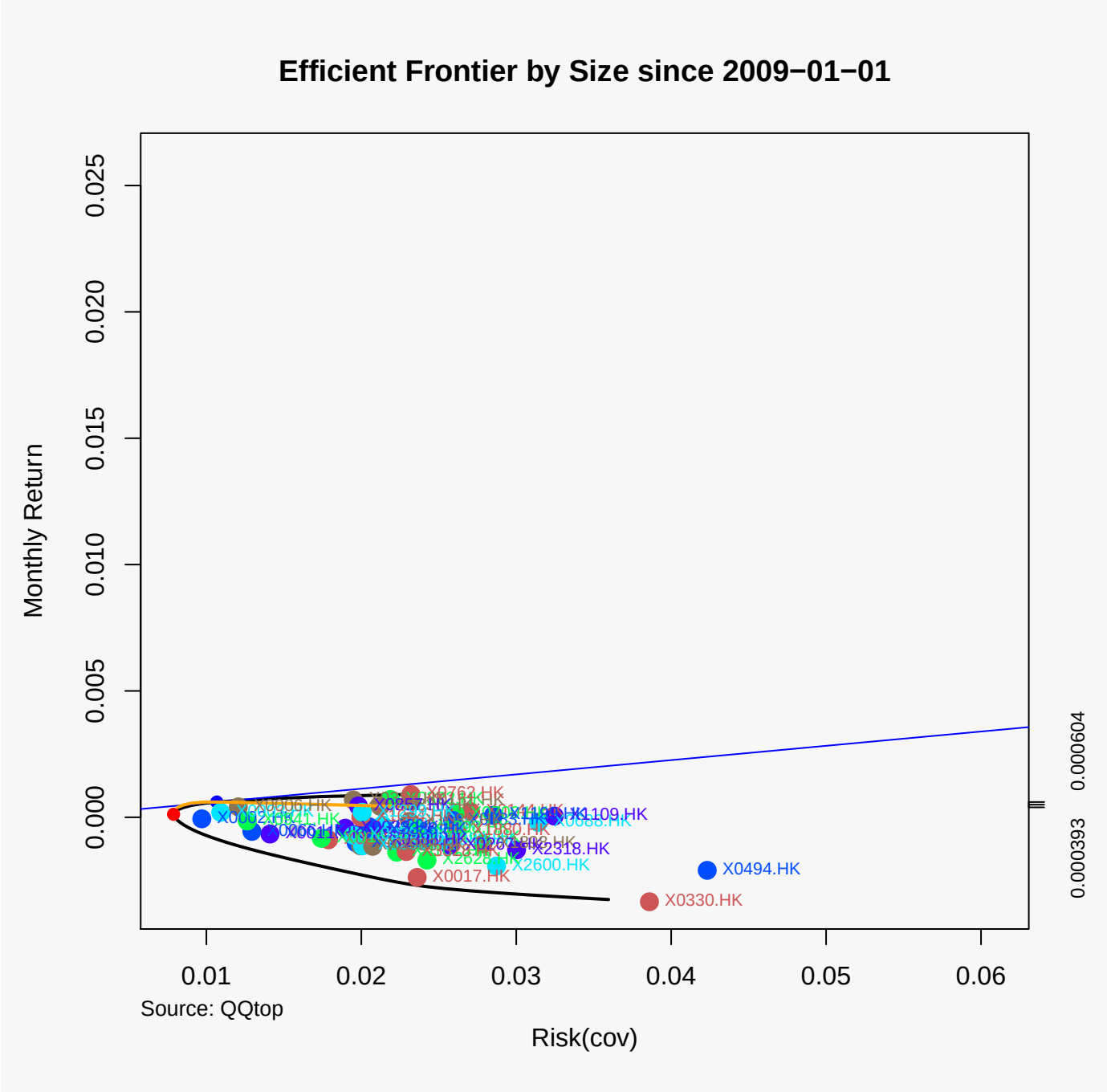
6.1 Performance Chart



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   0.0667   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.4209   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.3452   0.1490   0.0000   0.0000   0.1520   0.0528   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   0.0899   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.4780   0.0932   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.2276   0.0681   0.0000   0.0857   0.0000   0.0000
## 37   0.0000   0.0000   0.0086   0.0077   0.0000   0.0866   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   0.9101   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0215   0.0000   0.2134   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0598   0.0000   0.1063   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0484   0.0263   0.0199   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0388.HK X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK X0857.HK X0883.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0405   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0182   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0343   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   1.0000   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   0.0381   0.0309   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   0.0867   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0135   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   0.0106   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.1979   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.3392   0.1375   0.0000   0.0000   0.1325   0.0593   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   0.0246   0.0000   0.0000   0.0000   0.0000   0.0000
## 13   0.0000   0.0000   0.5083   0.0537   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0000   0.3576   0.0666   0.0000   0.0606   0.0000   0.0000
## 37   0.0000   0.0000   0.0132   0.0095   0.0000   0.0952   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   0.9754   0.0000
## 13   0.0000   0.0000   0.0000   0.0000   0.0124   0.0000   0.3074   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0584   0.0000   0.2159   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0597   0.0211   0.0349   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
##    X0388.HK X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK X0857.HK X0883.HK
## 1    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
## 13   0.0000   0.0386   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 25   0.0000   0.0262   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
## 37   0.0000   0.0000   0.0000   0.0000   0.0000   0.0297   0.0000   0.0000
## 49   0.0000   0.0000   0.0000   0.0000   1.0000   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   0.0382   0.0299   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   0.0691   0.0000   0.0000
## 25   0.0000   0.0000   0.0000   0.0000   0.0000   0.0168   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  -0.0033 -0.0033  0.0360  0.0360  0.0973  0.0533
## 13 -0.0022 -0.0022  0.0195  0.0195  0.0498  0.0353
## 25 -0.0012 -0.0012  0.0123  0.0123  0.0313  0.0255
## 37 -0.0001 -0.0001  0.0082  0.0082  0.0191  0.0146
## 49  0.0009  0.0009  0.0232  0.0232  0.0495  0.0370
##
## Description:
##  Mon Jan 16 21:31:39 2012 by user:
```

7 HSI Components Ratios

7.1 Sharpe Ratio - Combined

```
##                                          daily.returns
## Annualized StdDev Sharpe (Rf=0%, p=95%):       -0.4904
## Annualized VaR Sharpe (Rf=0%, p=95%):          -5.0836
## Annualized ES Sharpe (Rf=0%, p=95%):           -3.9665
```

7.2 Sharpe - Distinct

```
##                                          X0001.HK X0002.HK X0003.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    0.239   0.5113   0.6046
## Annualized VaR Sharpe (Rf=0%, p=95%):       2.538   5.1633   5.7759
## Annualized ES Sharpe (Rf=0%, p=95%):        1.975   3.6208   2.4877
##                                          X0004.HK X0005.HK X0006.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.5357  -0.2038   0.5374
## Annualized VaR Sharpe (Rf=0%, p=95%):      5.8316  -2.1159   5.5244
## Annualized ES Sharpe (Rf=0%, p=95%):       4.5762  -1.0252   3.9395
##                                          X0011.HK X0012.HK X0013.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.1524   0.2837   0.5743
## Annualized VaR Sharpe (Rf=0%, p=95%):     -1.7505   3.1345   6.2867
## Annualized ES Sharpe (Rf=0%, p=95%):      -1.6912   2.5018   4.8766
##                                          X0016.HK X0017.HK X0019.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.4388  -0.0993    0.364
## Annualized VaR Sharpe (Rf=0%, p=95%):      4.6818  -1.0403    3.606
## Annualized ES Sharpe (Rf=0%, p=95%):       3.6625  -0.7288    2.127
##                                          X0023.HK X0066.HK X0083.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.5675   0.5149   0.2674
## Annualized VaR Sharpe (Rf=0%, p=95%):      7.0316   6.0152   2.8205
## Annualized ES Sharpe (Rf=0%, p=95%):       6.9075   5.1265   2.0604
##                                          X0101.HK X0144.HK X0151.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2306   0.3756   0.9619
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.4882   4.0282  10.3071
## Annualized ES Sharpe (Rf=0%, p=95%):       1.9556   3.2020   7.7812
##                                          X0267.HK X0291.HK X0293.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2435   0.6763   0.4546
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.8200   7.3175   4.7474
## Annualized ES Sharpe (Rf=0%, p=95%):       2.4035   5.8584   3.5514
##                                          X0322.HK X0330.HK X0386.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    1.113  -0.6845   0.6473
## Annualized VaR Sharpe (Rf=0%, p=95%):      15.208  -6.2976   6.6521
## Annualized ES Sharpe (Rf=0%, p=95%):       15.208  -3.3604   4.9913
##                                          X0388.HK X0494.HK X0688.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.4781   0.0786   0.1558
## Annualized VaR Sharpe (Rf=0%, p=95%):      5.4069   1.0371   1.8104
## Annualized ES Sharpe (Rf=0%, p=95%):       4.4181   1.0371   1.5676
##                                          X0700.HK X0762.HK X0836.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):    1.224   0.4461   0.0395
## Annualized VaR Sharpe (Rf=0%, p=95%):      12.929   4.9893   0.4061
## Annualized ES Sharpe (Rf=0%, p=95%):        9.607   4.0018   0.3223
##                                          X0857.HK X0883.HK X0939.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.4463   0.6394   0.2509
## Annualized VaR Sharpe (Rf=0%, p=95%):      4.4853   6.6843   2.4816
## Annualized ES Sharpe (Rf=0%, p=95%):       3.4007   5.0128   1.7233
##                                          X0941.HK X1044.HK X1088.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.0817    1.178   0.6373
## Annualized VaR Sharpe (Rf=0%, p=95%):     -0.8617   13.021   6.4505
## Annualized ES Sharpe (Rf=0%, p=95%):      -0.6649   10.111   4.9553
##                                          X1109.HK X1199.HK X1299.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2075   0.1837   0.0916
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.4420   2.0209   0.9395
## Annualized ES Sharpe (Rf=0%, p=95%):       2.1143   1.6254   0.5962
##                                          X1398.HK X1880.HK X1898.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.1752    1.103   0.2805
## Annualized VaR Sharpe (Rf=0%, p=95%):      1.9707   12.526   2.7386
```

```
## Annualized ES Sharpe (Rf=0%, p=95%):       1.6125    9.909   1.8522
##                                          X2318.HK X2388.HK X2600.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):   0.2281   0.8635  -0.1348
## Annualized VaR Sharpe (Rf=0%, p=95%):      2.3962   9.8805  -1.4284
## Annualized ES Sharpe (Rf=0%, p=95%):       1.7006   8.0054  -1.1283
##                                          X2628.HK X3328.HK X3988.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):  -0.1941  -0.0156   0.4011
## Annualized VaR Sharpe (Rf=0%, p=95%):     -1.9151  -0.1575   4.2094
## Annualized ES Sharpe (Rf=0%, p=95%):      -1.3297  -0.1165   3.0504
```

7.3 Information Ratio - Combined

```
## [1] "Information Ratio :  -0.0885"
```

7.4 Information Ratio - Distinct

```
##                          X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK
## Information Ratio: HSI  -0.1182  -0.1181    0.156   0.4099  -0.6864
##                          X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK
## Information Ratio: HSI  -0.0151  -0.6677   0.0061   0.4086   0.2238
##                          X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK
## Information Ratio: HSI  -0.4774    0.075   0.3969   0.0812   0.0449
##                          X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK
## Information Ratio: HSI  -0.0126   0.2311   0.6602   0.0251   0.5197
##                          X0293.HK X0322.HK X0330.HK X0386.HK X0388.HK
## Information Ratio: HSI   0.2064   0.7559  -0.9853   0.5222   0.3615
##                          X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK
## Information Ratio: HSI  -0.0933  -0.0899    1.229   0.1935  -0.2606
##                          X0857.HK X0883.HK X0939.HK X0941.HK X1044.HK
## Information Ratio: HSI   0.2846   0.6665  -0.0911  -0.6239    0.887
##                          X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## Information Ratio: HSI   0.6307   0.0124  -0.0234   0.7138  -0.1869
##                          X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK
## Information Ratio: HSI   0.9949   0.1127   -9e-04   0.7623   -0.491
##                          X2628.HK X3328.HK X3988.HK
## Information Ratio: HSI  -0.7856  -0.5354   0.1764
```

8 HSI Components Table Latest Quotes

```
## [1] "Date :  2012-01-16 02:59:00"

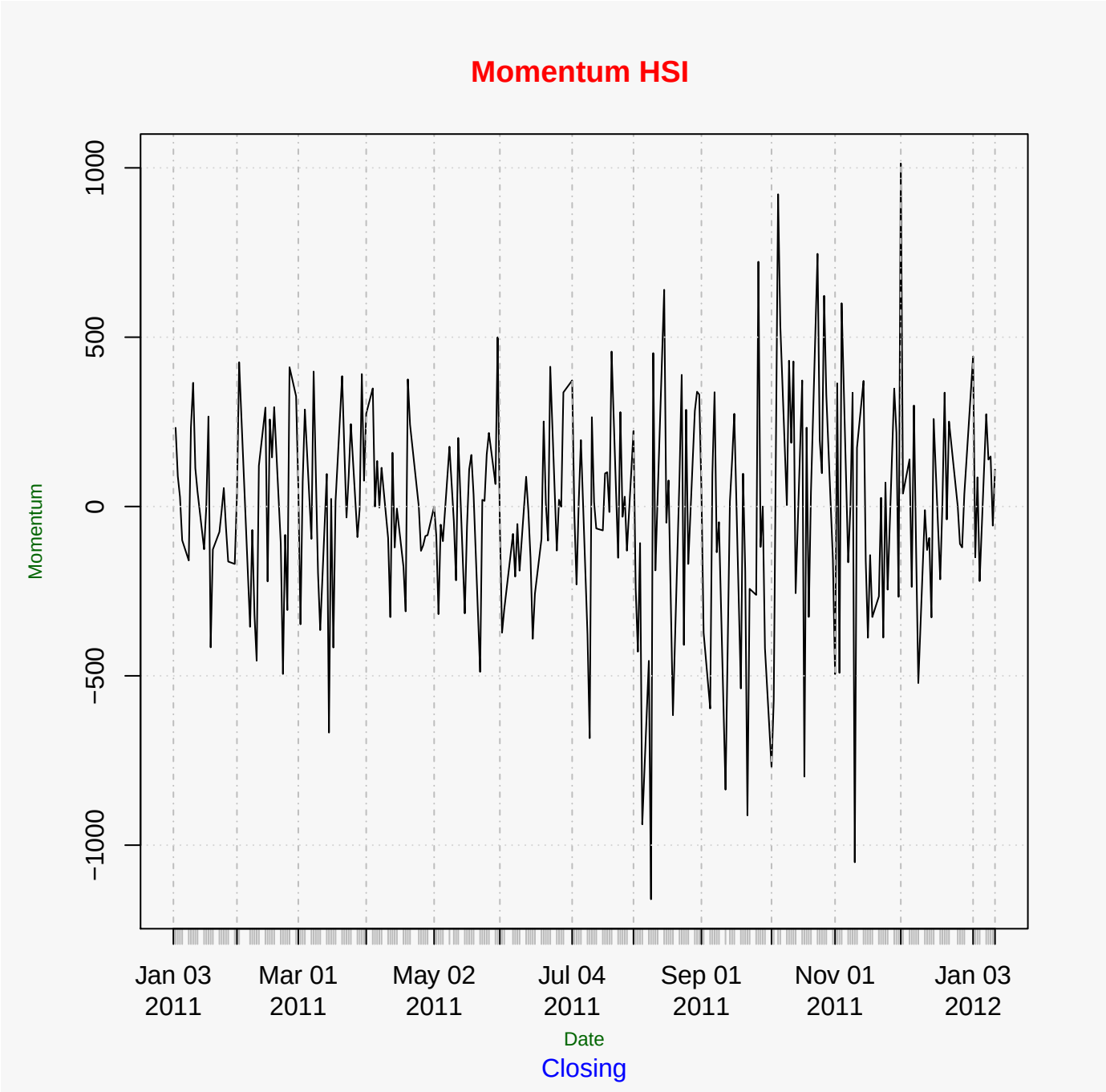
##                    Name    Bid    Ask Change   52-week Range
## 0001.HK     CHEUNG KONG  94.75  94.85  -1.10  79.10 - 137.60
## 0002.HK    CLP HOLDINGS  63.15  63.20  -0.85   59.85 - 75.20
## 0003.HK  HK & CHINA GAS  17.82  17.84  -0.10   16.70 - 19.68
## 0004.HK  WHARF HOLDINGS  38.80  38.95  -1.10   33.15 - 63.80
## 0005.HK   HSBC HOLDINGS  59.65  59.70  -0.50   56.35 - 91.90
## 0006.HK    POWER ASSETS  55.35  55.50  -0.80   48.10 - 64.80
## 0011.HK  HANG SENG BANK  93.60  93.65   0.35  84.40 - 134.40
## 0012.HK  HENDERSON LAND  40.15  40.20  -0.30   33.20 - 61.50
## 0013.HK       HUTCHISON  67.25  67.30  -1.00   53.60 - 97.45
## 0016.HK         SHK PPT 100.20 100.40  -0.10  85.45 - 147.00
## 0017.HK   NEW WORLD DEV   7.14   7.16  -0.06    7.00 - 17.98
## 0019.HK SWIRE PACIFIC A  78.10  78.20   0.15  79.30 - 137.20
## 0023.HK  BANK OF E ASIA  29.00  29.10  -0.20   21.85 - 36.60
## 0066.HK MTR CORPORATION  25.15  25.25  -0.10   22.45 - 31.55
## 0083.HK       SINO LAND  11.30  11.34  -0.20    9.33 - 18.90
## 0101.HK   HANG LUNG PPT  23.80  23.85  -0.35   20.85 - 40.50
## 0144.HK  CHINA MER HOLD  24.85  24.90  -0.05   19.00 - 37.60
## 0151.HK WANT WANT CHINA   7.55   7.56  -0.16     5.68 - 8.30
## 0267.HK   CITIC PACIFIC  13.68  13.70  -0.18   10.26 - 24.60
## 0291.HK CHINA RESOURCES  27.85  27.95   0.20   24.10 - 35.50
## 0293.HK  CATHAY PAC AIR  13.70  13.76  -0.22   11.80 - 24.10
## 0322.HK          TINGYI  23.40  23.50  -0.20   17.32 - 26.00
## 0330.HK ESPRIT HOLDINGS  11.42  11.44  -0.26    7.55 - 45.65
## 0386.HK    SINOPEC CORP   8.67   8.69  -0.22     6.22 - 8.90
## 0388.HK            HKEX 122.00 122.10  -1.20  99.15 - 198.60
## 0494.HK       LI & FUNG  15.72  15.84  -0.12   10.82 - 51.95
## 0688.HK  CHINA OVERSEAS  13.54  13.58  -0.16    9.99 - 17.86
## 0700.HK         TENCENT 169.90 170.10   0.00 139.90 - 230.80
## 0762.HK    CHINA UNICOM  14.40  14.42  -0.72   10.24 - 17.68
## 0836.HK CHINA RES POWER  15.62  15.64  -0.10   10.82 - 16.44
## 0857.HK      PETROCHINA  10.86  10.90  -0.10    8.59 - 12.50
## 0883.HK           CNOOC  14.82  14.84  -0.24   11.20 - 21.30
## 0939.HK             CCB   5.72   5.73  -0.01     4.41 - 8.47
## 0941.HK    CHINA MOBILE  75.00  75.05  -1.10   68.05 - 83.80
## 1044.HK    HENGAN INT'L  70.00  70.05  -0.80   54.10 - 75.40
## 1088.HK   CHINA SHENHUA  33.65  33.70  -0.50   27.10 - 40.20
## 1109.HK  CHINA RES LAND  12.90  12.92  -0.38    7.28 - 17.24
## 1199.HK   COSCO PACIFIC  10.46  10.48  -0.02    7.52 - 17.16
## 1299.HK             AIA  23.90  24.00   0.10   19.84 - 29.90
## 1398.HK            ICBC   5.14   5.15  -0.01     3.46 - 6.90
## 1880.HK     BELLE INT'L  11.56  11.58  -0.30   11.56 - 17.54
## 1898.HK      CHINA COAL   9.35   9.36  -0.21    6.59 - 15.08
## 2318.HK         PING AN  51.35  51.40  -1.30   37.35 - 96.25
## 2388.HK   BOC HONG KONG  19.66  19.68  -0.10   14.24 - 29.40
## 2600.HK          CHALCO   3.56   3.58  -0.11     3.20 - 8.30
## 2628.HK      CHINA LIFE  19.36  19.38  -0.67   17.04 - 36.90
## 3328.HK        BANKCOMM   5.78   5.79  -0.05     4.15 - 9.53
## 3988.HK   BANK OF CHINA   3.16   3.17  -0.01     2.20 - 5.02
```

9 Hang Seng Index

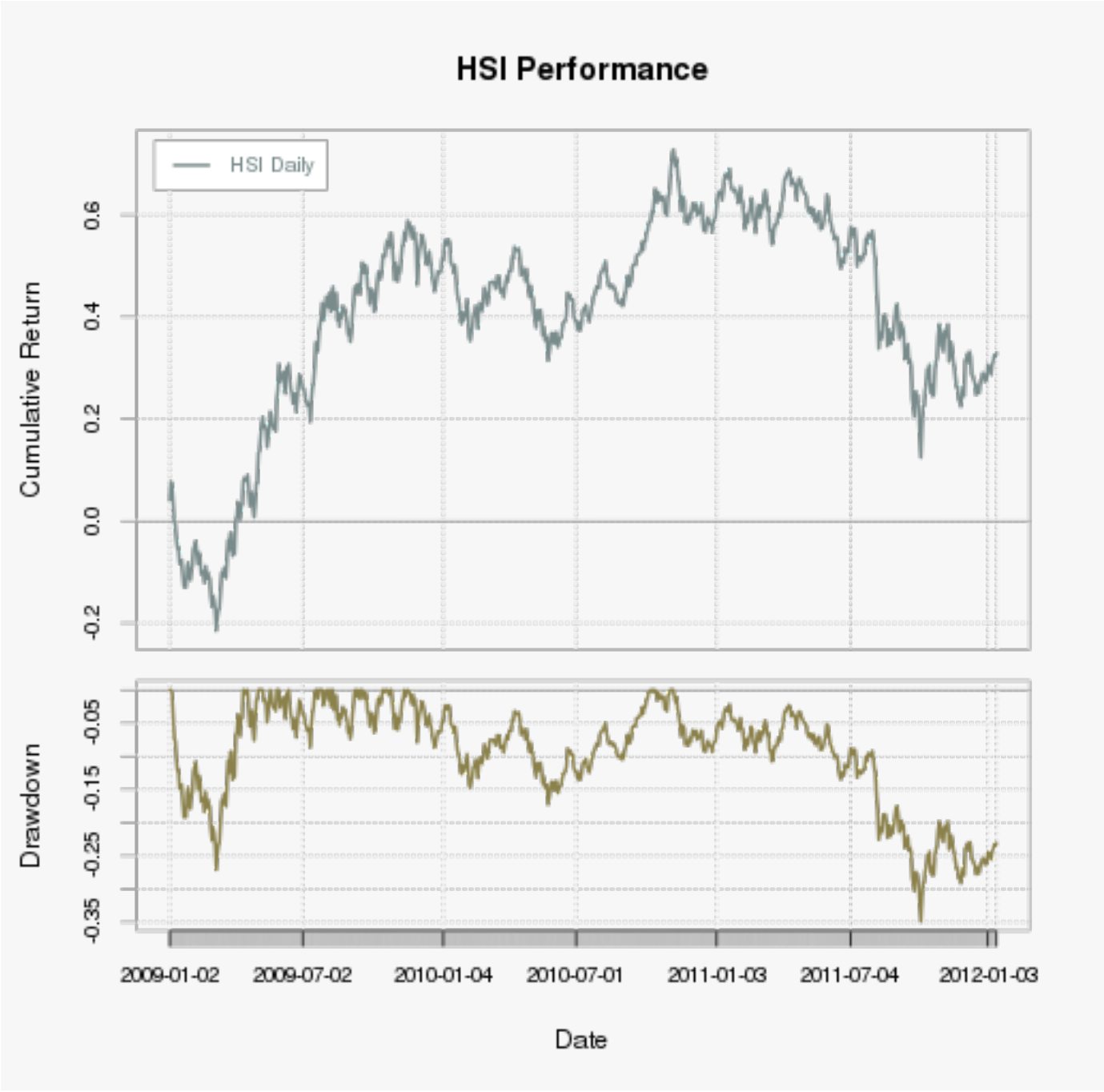
Latest Hang Seng Index

	Trade Time	Name	Last	Change	Days Range	52−week Range
^HSI	2012−01−16 03:01:00	HANG SENG INDEX	19012	−192.2	18985.75 − 19070.74	16170.30 − 24468.60

9.1 Hang Seng Index - Momentum



9.2 HSI Performance



9.3 HSI Ratios

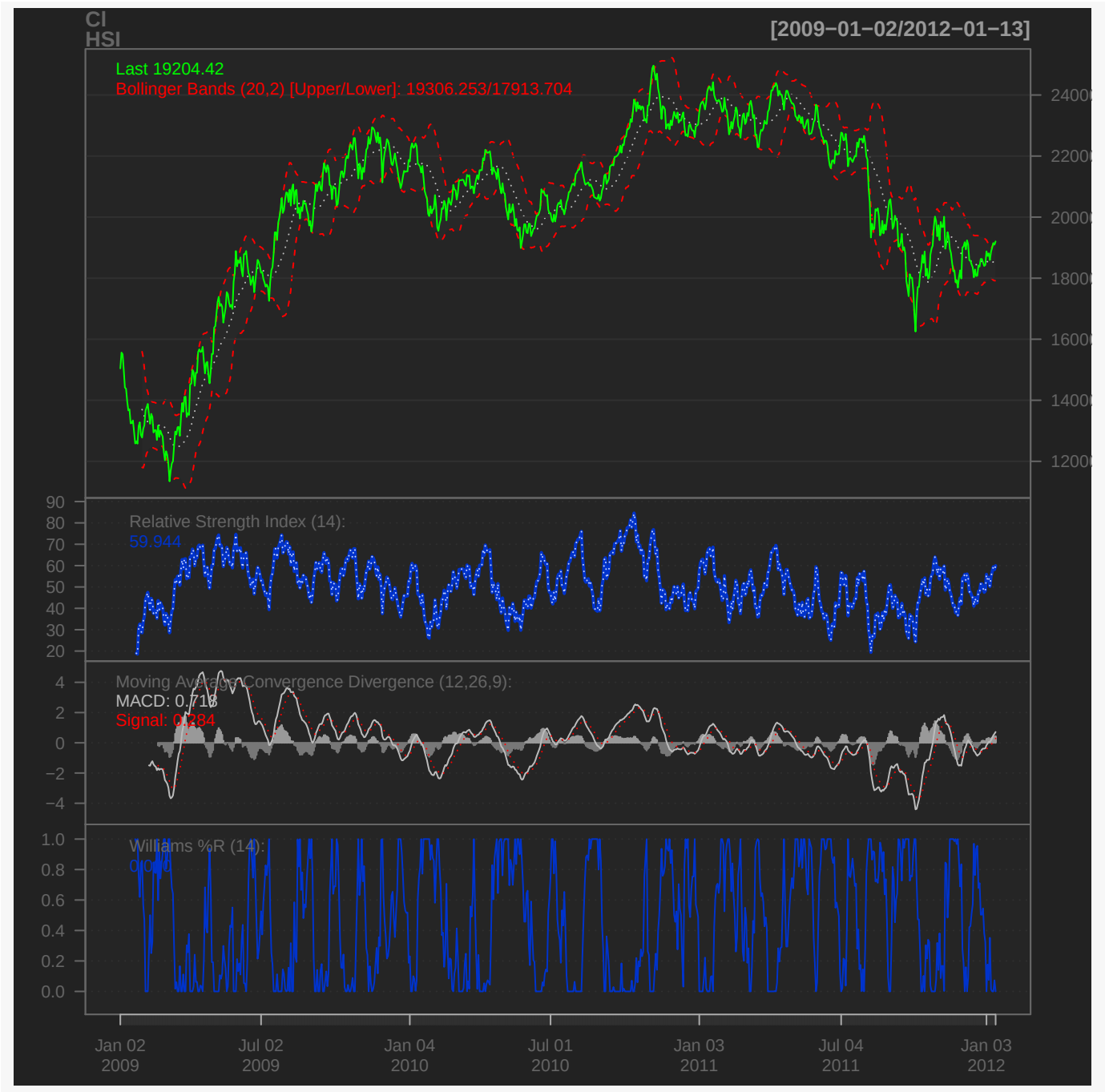
```
##               RSI
## 2011-12-30 48.19
## 2012-01-03 55.91
## 2012-01-04 53.03
## 2012-01-05 54.48
## 2012-01-06 50.21
## 2012-01-09 54.92
## 2012-01-10 57.14
## 2012-01-11 59.43
## 2012-01-12 58.15
## 2012-01-13 59.94
```

```
##                macd  signal
## 2011-12-30 -0.3659 -0.4762
## 2012-01-03 -0.1557 -0.4121
## 2012-01-04 -0.0542 -0.3405
## 2012-01-05  0.0629 -0.2598
## 2012-01-06  0.0592 -0.1960
## 2012-01-09  0.1725 -0.1223
## 2012-01-10  0.3183 -0.0342
## 2012-01-11  0.4913  0.0709
## 2012-01-12  0.5965  0.1760
## 2012-01-13  0.7180  0.2844
```

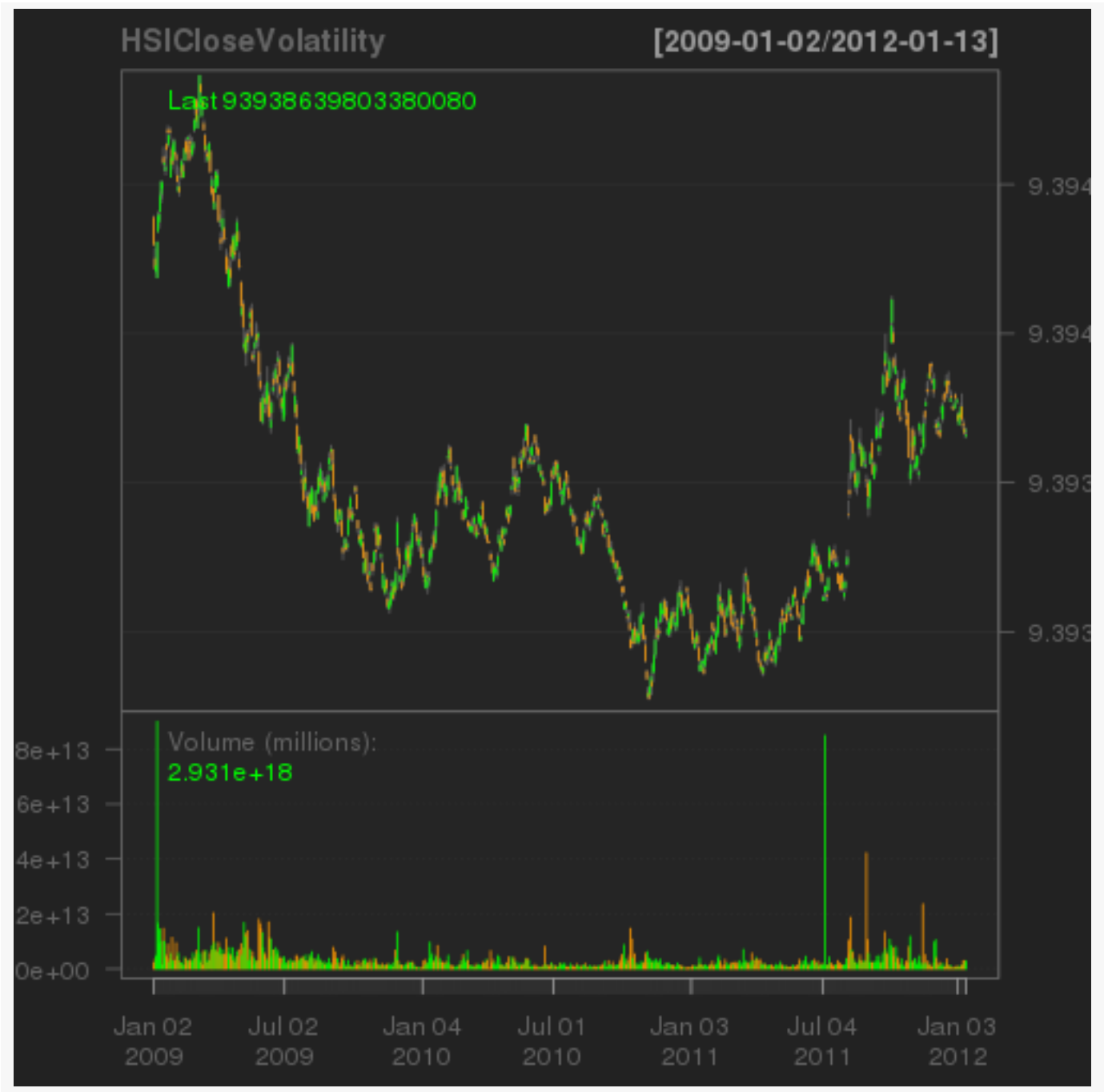
```
## [1] "BBands"
```

```
##                dn  mavg    up   pctB
## 2011-12-30 17858 18567 19276 0.4065
## 2012-01-03 17868 18559 19250 0.7305
## 2012-01-04 17901 18536 19172 0.6503
## 2012-01-05 17908 18530 19151 0.7282
## 2012-01-06 17967 18497 19028 0.5901
## 2012-01-09 18002 18485 18969 0.8934
## 2012-01-10 17974 18506 19039 0.9674
## 2012-01-11 17933 18535 19137 1.0120
## 2012-01-12 17919 18567 19216 0.9073
## 2012-01-13 17914 18610 19306 0.9269
```

```
##             WPR %
## 2011-12-30 32.34
## 2012-01-03  0.00
## 2012-01-04 17.65
## 2012-01-05  7.52
## 2012-01-06 35.23
## 2012-01-09  1.45
## 2012-01-10  0.00
## 2012-01-11  0.00
## 2012-01-12  7.31
## 2012-01-13  0.00
```


CI
HSI
[2009−01−02/2012−01−13]
Last 19204.42
Bollinger Bands (20,2) [Upper/Lower]: 19306.253/17913.704
Relative Strength Index (14):
59.944
Moving Average Convergence Divergence (12,26,9):
MACD: 0.718
Signal: 0.284
Williams %R (14):
0.0000
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%):    0.3791      0.3465
## Annualized VaR Sharpe (Rf=0%, p=95%):       3.8828      0.8291
## Annualized ES Sharpe (Rf=0%, p=95%):        2.8705      0.6491
```

```
##          HSI-Daily HSI-Monthly
## Skewness    0.1209      0.1361
```

```
##          HSI-Daily HSI-Monthly
## Kurtosis     1.398     0.07373
```

```
##       Index              HSI Daily
##  Min.   :2009-01-02   Min.   :-0.056605
##  1st Qu.:2009-10-06   1st Qu.:-0.008124
##  Median :2010-07-10   Median : 0.000257
##  Mean   :2010-07-09   Mean   : 0.000504
##  3rd Qu.:2011-04-10   3rd Qu.: 0.010182
##  Max.   :2012-01-13   Max.   : 0.074147
```

```
##       Index             HSI Monthly
##  Min.   :2009-01-30   Min.   :-0.14329
##  1st Qu.:2009-10-30   1st Qu.:-0.02346
##  Median :2010-07-30   Median : 0.00812
##  Mean   :2010-07-30   Mean   : 0.00890
##  3rd Qu.:2011-04-29   3rd Qu.: 0.03806
##  Max.   :2012-01-13   Max.   : 0.17074
```

10 Dataset First and Last Rows Info

```
##            X0001.HK.Close
## 2009-01-02           76.9
## 2012-01-13           96.0
##            X0002.HK.Close
## 2009-01-02          52.40
## 2012-01-13          64.05
##            X0003.HK.Close
## 2009-01-02          12.08
## 2012-01-13          17.94
##            X0004.HK.Close
## 2009-01-02           22.0
## 2012-01-13           39.9
##            X0005.HK.Close
## 2009-01-02          77.00
## 2012-01-13          60.05
##            X0006.HK.Close
## 2009-01-02          42.75
## 2012-01-13          56.15
##            X0011.HK.Close
## 2009-01-02          104.7
## 2012-01-13           93.3
##            X0012.HK.Close
## 2009-01-02          30.35
## 2012-01-13          40.50
##            X0013.HK.Close
## 2009-01-02          39.85
## 2012-01-13          68.05
##            X0016.HK.Close
## 2009-01-02           67.3
## 2012-01-13          100.5
##            X0017.HK.Close
## 2009-01-02           8.18
## 2012-01-13           7.21
##            X0019.HK.Close
## 2009-01-02          55.75
## 2012-01-13          78.15
##            X0023.HK.Close
## 2009-01-02          16.68
## 2012-01-13          29.10
##            X0066.HK.Close
## 2009-01-02          18.08
## 2012-01-13          25.25
##            X0083.HK.Close
## 2009-01-02           8.36
## 2012-01-13          11.52
##            X0101.HK.Close
## 2009-01-02          18.36
## 2012-01-13          24.15
##            X0144.HK.Close
## 2009-01-02          15.40
## 2012-01-13          24.95
##            X0151.HK.Close
## 2009-01-02           3.17
## 2012-01-13           7.72
##            X0267.HK.Close
```

```
## 2009-01-02          10.20
## 2012-01-13          13.88
##            X0291.HK.Close
## 2009-01-02           14.0
## 2012-01-13           27.7
##            X0293.HK.Close
## 2009-01-02           8.91
## 2012-01-13          13.94
##            X0322.HK.Close
## 2009-01-02           8.98
## 2012-01-13          23.50
##            X0330.HK.Close
## 2009-01-02          44.80
## 2012-01-13          11.68
##            X0386.HK.Close
## 2009-01-02           4.96
## 2012-01-13           8.90
##            X0388.HK.Close
## 2009-01-02           76.6
## 2012-01-13          123.2
##            X0494.HK.Close
## 2009-01-02          14.04
## 2012-01-13          15.96
##            X0688.HK.Close
## 2009-01-02          11.22
## 2012-01-13          13.74
##            X0700.HK.Close
## 2009-01-01           50.0
## 2012-01-13          170.2
##            X0762.HK.Close
## 2009-01-01           9.63
## 2012-01-13          15.10
##            X0836.HK.Close
## 2009-01-02          15.12
## 2012-01-13          15.74
##            X0857.HK.Close
## 2009-01-02           7.20
## 2012-01-13          10.96
##            X0883.HK.Close
## 2009-01-02           7.59
## 2012-01-13          15.10
##            X0939.HK.Close
## 2009-01-02           4.52
## 2012-01-13           5.74
##            X0941.HK.Close
## 2009-01-02           81.2
## 2012-01-13           76.2
##            X1044.HK.Close
## 2009-01-01          24.90
## 2012-01-13          70.95
##            X1088.HK.Close
## 2009-01-02          17.40
## 2012-01-13          34.05
##            X1109.HK.Close
## 2009-01-02           9.90
## 2012-01-13          13.34
##            X1199.HK.Close
```

```
## 2009-01-02           8.07
## 2012-01-13          10.48
##            X1299.HK.Close
## 2010-10-29           23.1
## 2012-01-13           23.9
##            X1398.HK.Close
## 2009-01-02           4.30
## 2012-01-13           5.15
##            X1880.HK.Close
## 2009-01-02           3.50
## 2012-01-13          11.86
##            X1898.HK.Close
## 2009-01-02           6.55
## 2012-01-13           9.55
##            X2318.HK.Close
## 2009-01-02           39.6
## 2012-01-13           52.6
##            X2388.HK.Close
## 2009-01-02           9.06
## 2012-01-13          19.76
##            X2600.HK.Close
## 2009-01-02           4.55
## 2012-01-13           3.68
##            X2628.HK.Close
## 2009-01-02          24.75
## 2012-01-13          20.00
##            X3328.HK.Close
## 2009-01-02           5.91
## 2012-01-13           5.81
##            X3988.HK.Close
## 2009-01-02           2.17
## 2012-01-13           3.18
```

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

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