CAPM and other Statistics for HSI Components $_{\rm Version~1.1}$

$QQtop^*$

Internet OpenSource Community † Worldwide

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

No mail. We just code!

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^{*}No funding received yet. Please donate urgently

[†]Itself

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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.

¹Wikipedia

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
                                      -0.0005
## Beta
                                       1.1854
## Beta+
                                       1.2542
## Beta-
                                       1.1992
## R-squared
                                       0.6417
## Annualized Alpha
                                       -0.1271
## Correlation
                                       0.8010
                                       0.0000
## Correlation p-value
## Tracking Error
                                       0.2713
## Active Premium
                                      -0.1583
## Information Ratio
                                      -0.5836
## Treynor Ratio
                                      -0.3169
```

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

CAPM - $Distinct\ for\ each\ stock$

##			0002.HK				
	Alpha	0.000	0.000	0.000	0.001	-0.001	0.000
	Beta	0.990	0.150	0.380	1.109	1.121	0.117
	Beta+	0.954	0.044	0.280	1.114	1.215	0.064
	Beta-	0.975	0.186	0.413	1.089	1.310	0.129
	R-squared	0.641	0.083	0.180	0.494	0.561	0.029
	Annualized Alpha	0.011	0.047	0.112	0.158	-0.140	0.077
	Correlation	0.800	0.288	0.424	0.702	0.749	0.172
	Correlation p-value	0.000	0.000	0.000	0.000	0.000	0.000
	Tracking Error	0.194	0.257	0.266	0.295	0.261	0.290
	Active Premium	-0.009	-0.054	0.028	0.132	-0.181	-0.035
	Information Ratio	-0.048	-0.209	0.106	0.447	-0.695	-0.122
	Treynor Ratio	0.105	0.395	0.372	0.221	-0.061	0.665
##			0012.HK				
	Alpha	0.000	0.000	0.000	0.000	0.000	0.000
	Beta	0.639	1.023	0.949	1.004	1.131	0.780
	Beta+	0.710	1.054	0.873	0.967	1.053	0.849
	Beta-	0.673	0.996	0.990	0.981	1.146	0.728
	R-squared	0.454	0.560	0.528	0.643	0.502	0.385
	Annualized Alpha	-0.079	0.039	0.129	0.071	-0.080	0.054
	Correlation	0.674	0.748	0.727	0.802	0.709	0.620
	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	0.264
	Active Premium	-0.135	0.014	0.105	0.057	-0.123	0.002
	Information Ratio	-0.657	0.057	0.447	0.291	-0.415	0.007
	Treynor Ratio	-0.035	0.124	0.230	0.169	-0.009	0.147
##			0066.HK				
	Alpha	0.000	0.000	0.000	0.000	0.000	0.001
	Beta	0.939	0.509	1.167	1.098	1.310	0.427
	Beta+	1.022	0.431	1.137	1.247	1.262	0.192
	Beta-	0.935	0.499	1.214	0.977	1.210	0.516
	R-squared	0.465	0.337	0.518	0.468	0.541	0.096
	Annualized Alpha	0.137	0.065	0.060	0.056	0.088	0.350
	Correlation	0.682	0.580	0.720	0.684	0.736	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	0.307	0.325	0.373
##	Active Premium	0.104	0.001	0.029	0.017	0.062	0.231
##	Information Ratio	0.396	0.006	0.099	0.054	0.192	0.620
##	Treynor Ratio	0.232	0.225	0.122	0.118	0.134	0.806
##		0267.HK	0291.HK				0386.HK
##	Alpha	0.000	0.001	0.000	0.001	-0.002	0.000
##	Beta	1.079	0.881	0.772	0.350	0.939	0.956
##	Beta+	1.030	0.772	0.732	0.262	0.742	0.805
##	Beta-	0.976	0.902	0.752	0.382	1.099	1.003
	R-squared	0.402	0.371	0.322	0.072	0.216	0.558
##	Annualized Alpha	0.056	0.187	0.120	0.390	-0.362	0.130
##	Correlation	0.634	0.609	0.568	0.268	0.464	0.747
##	${\tt Correlation} \ p{\tt -value}$	0.000	0.000	0.000	0.000	0.000	0.000
##	Tracking Error	0.344	0.301	0.298	0.369	0.468	0.222
##	Active Premium	0.003	0.139	0.060	0.267	-0.480	0.110
##	Information Ratio	0.008	0.462	0.201	0.723	-1.027	0.497
##	Treynor Ratio	0.107	0.286	0.224	1.086	-0.391	0.234
##		0388.HK	0494.HK	0688.HK	0700.HK	0762.HK	0836.HK
##	Alpha	0.000	0.001	0.000	0.002	0.000	0.000
##	Beta	1.159	1.234	1.185	0.934	0.703	0.558

	Beta+	1.246	1.139	1.340	0.966	0.548	0.432
	Beta-	1.103	0.898	0.926	0.784	0.648	0.662
	R-squared	0.706	0.456	0.473	0.355	0.255	0.180
##	Annualized Alpha	0.082	0.393	0.027	0.457	0.107	-0.022
##	Correlation	0.840	0.675	0.688	0.596	0.505	0.424
##	Correlation p-value	0.000	0.000	0.000	0.000	0.000	0.000
##	Tracking Error	0.200	0.410	0.330	0.329	0.323	0.332
##	Active Premium	0.082	0.147	-0.014	0.416	0.033	-0.116
##	Information Ratio	0.408	0.358	-0.043	1.264	0.101	-0.348
##	Treynor Ratio	0.168	-0.072	0.084	0.559	0.205	-0.005
##		0857.HK	0883.HK	0939.HK	0941.HK	1044.HK	1088.HK
##	Alpha	0.000	0.000	0.000	0.000	0.001	0.000
##	Beta	1.101	1.283	1.062	0.709	0.465	1.217
##	Beta+	1.012	1.190	1.003	0.706	0.360	1.139
##	Beta-	1.096	1.246	1.036	0.734	0.414	1.142
##	R-squared	0.725	0.686	0.700	0.520	0.119	0.650
##	Annualized Alpha	0.053	0.147	0.004	-0.085	0.408	0.148
##	Correlation	0.852	0.828	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	0.182	0.194	0.357	0.240
##	Active Premium	0.049	0.154	-0.009	-0.134	0.301	0.148
##	Information Ratio	0.275	0.647	-0.049	-0.693	0.843	0.618
##	Treynor Ratio	0.148	0.208	0.098	-0.030	0.879	0.215
##		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	1.162	1.332	0.825	1.126	0.826	1.496
##	Beta+	1.223	1.338	0.812	1.095	0.776	1.397
##	Beta-	0.777	1.427	1.053	1.055	0.898	1.438
##	R-squared	0.361	0.492	0.411	0.687	0.223	0.664
##	Annualized Alpha	0.074	0.030	0.242	-0.018	0.503	0.043
##	Correlation	0.601	0.702	0.641	0.829	0.472	0.815
##	Correlation p-value	0.000	0.000	0.000	0.000	0.000	0.000
	Tracking Error	0.406	0.364	0.246	0.201	0.405	0.307
	Active Premium	0.003	-0.013	0.210	-0.032	0.410	0.035
##	Information Ratio	0.006	-0.035	0.853	-0.158	1.014	0.114
##	Treynor Ratio	0.100	0.075	0.112	0.072	0.634	0.099
##	•				2628.HK		3988.HK
##	Alpha	0.000	0.001	0.000	0.000	0.000	0.000
	Beta	1.327	0.877	1.540	1.091	1.191	1.033
	Beta+	1.375	0.888	1.581	1.063	1.159	0.956
	Beta-	1.225	0.846	1.394	1.065	1.215	1.009
	R-squared	0.622	0.442	0.622	0.638	0.728	0.631
	Annualized Alpha	0.046	0.223	-0.122	-0.126	-0.092	0.052
	Correlation	0.788	0.665	0.788	0.799	0.853	0.795
	Correlation p-value	0.000	0.000	0.000	0.000	0.000	0.000
	Tracking Error	0.284	0.259	0.344	0.216	0.197	0.206
	Active Premium	0.032	0.192	-0.153	-0.156	-0.108	0.036
	Information Ratio	0.114	0.742	-0.446	-0.722	-0.550	0.177
	Treynor Ratio	0.110	0.348	-0.026	-0.039	0.004	0.145
	3,	0.110	0.010	0.020	3.000	0.001	0.110

3 HSI Components Risk

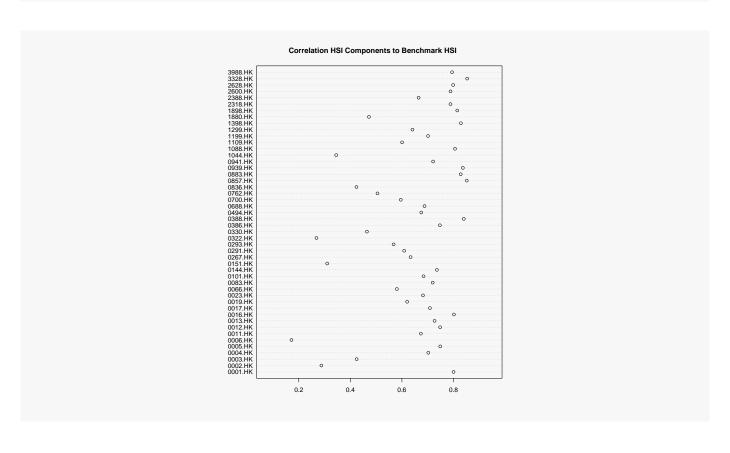
3.1 Correlation

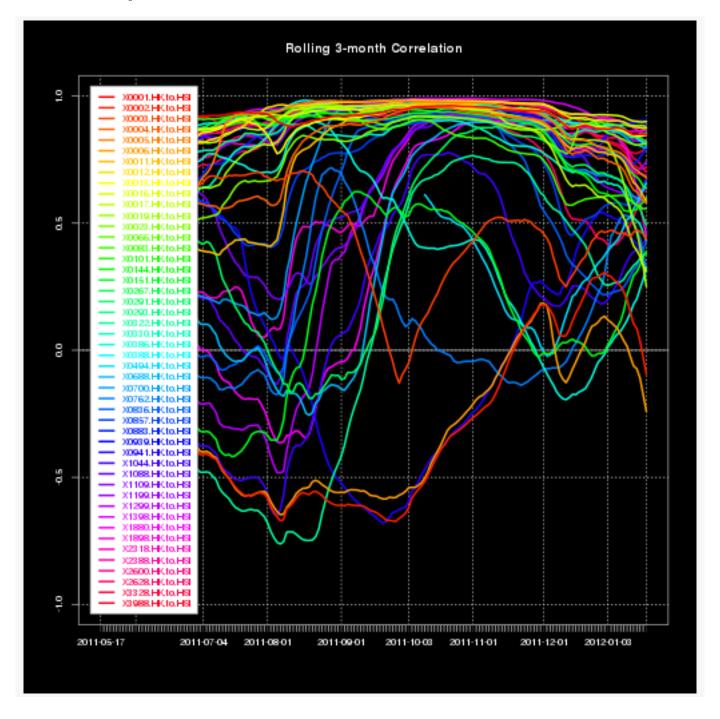
Correlation Combined

```
## Correlation p-value Lower CI Upper CI
## HSI Components to HSI 0.801 0 0.7137 0.8639
```

Correlation - Distinct

```
Correlation p-value Lower CI Upper CI
## 0001.HK
                 0.8004
                              0
                                   0.7641
                                            0.8317
## 0002.HK
                 0.2876
                              0
                                   0.1995
                                            0.3711
## 0003.HK
                 0.4244
                              0
                                   0.3445
                                            0.4981
## 0004.HK
                                  0.6519
                 0.7025
                              0
                                            0.7470
## 0005.HK
                                 0.7046
                 0.7488
                              0
                                            0.7872
## 0006.HK
                              0
                                 0.0794
                                            0.2608
                 0.1716
## 0011.HK
                 0.6735
                              0
                                 0.6190
                                            0.7215
## 0012.HK
                                 0.7041
                 0.7483
                              0
                                            0.7868
## 0013.HK
                 0.7267
                              0
                                  0.6794
                                            0.7680
## 0016.HK
                                   0.7656
                 0.8017
                              0
                                            0.8327
## 0017.HK
                 0.7087
                              0
                                   0.6589
                                            0.7523
                                  0.5593
## 0019.HK
                              0
                 0.6203
                                            0.6747
## 0023.HK
                 0.6817
                              0
                                 0.6282
                                            0.7287
## 0066.HK
                                 0.5149
                 0.5804
                                            0.6392
## 0083.HK
                              0
                                   0.6711
                                            0.7617
                 0.7195
## 0101.HK
                               0
                                   0.6309
                                            0.7308
                 0.6840
## 0144.HK
                 0.7357
                               0
                                   0.6897
                                            0.7758
## 0151.HK
                 0.3102
                               0
                                   0.2232
                                            0.3923
## 0267.HK
                 0.6337
                               0
                                   0.5742
                                            0.6865
## 0291.HK
                 0.6089
                                   0.5465
                               0
                                            0.6645
## 0293.HK
                 0.5678
                               0
                                   0.5010
                                            0.6280
## 0322.HK
                 0.2685
                              0
                                   0.1795
                                            0.3531
## 0330.HK
                                  0.3877
                                            0.5346
                 0.4643
                              0
## 0386.HK
                                   0.7029
                 0.7473
                              0
                                            0.7858
## 0388.HK
                 0.8400
                              0
                                  0.8102
                                            0.8656
## 0494.HK
                 0.6752
                              0
                                  0.5470
                                            0.7725
## 0688.HK
                              0
                                  0.6351
                 0.6877
                                            0.7340
## 0700.HK
                 0.5957
                              0
                                 0.5319
                                            0.6527
## 0762.HK
                                 0.4324
                 0.5053
                                            0.5717
## 0836.HK
                 0.4237
                              0
                                  0.3438
                                            0.4974
## 0857.HK
                                   0.8237
                 0.8516
                               0
                                            0.8754
## 0883.HK
                 0.8280
                               0
                                   0.7961
                                            0.8553
## 0939.HK
                               0
                                   0.8060
                                            0.8625
                 0.8364
## 0941.HK
                 0.7210
                               0
                                   0.6728
                                            0.7630
                                   0.2604
## 1044.HK
                 0.3452
                               0
                                            0.4248
## 1088.HK
                 0.8061
                               0
                                   0.7707
                                            0.8365
                                   0.5374
## 1109.HK
                 0.6007
                               0
                                            0.6573
                                            0.7461
## 1199.HK
                                   0.6507
                 0.7015
                               0
## 1299.HK
                               0
                                   0.5451
                                            0.7201
                 0.6409
## 1398.HK
                 0.8289
                               0
                                   0.7972
                                            0.8561
## 1880.HK
                                   0.3961
                 0.4721
                              0
                                            0.5417
## 1898.HK
                              0
                                   0.7806
                 0.8147
                                            0.8439
## 2318.HK
                              0
                                   0.7501
                                            0.8213
                 0.7883
## 2388.HK
                 0.6648
                                   0.6092
                                            0.7139
## 2600.HK
                 0.7885
                                   0.7503
                                            0.8214
## 2628.HK
                                   0.7623
                                            0.8303
                 0.7989
```

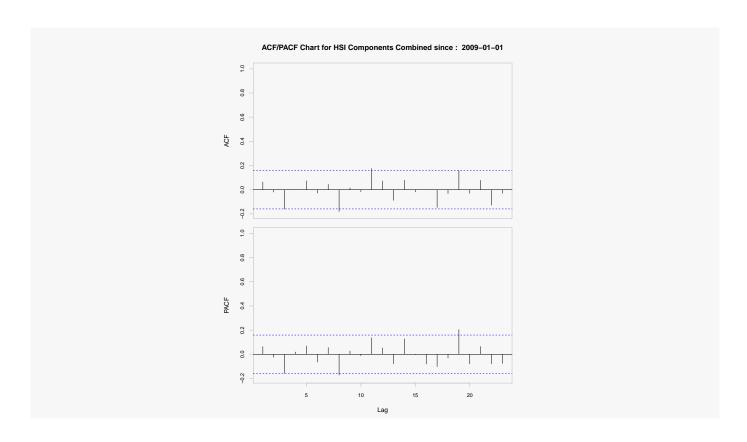




3.2 Autocorrelation Coefficients - Combined

 $Autocorrelation\ Combined$

```
## rho1 rho2 rho3 rho4 rho5 rho6 Q(6) p-value
## daily.returns 0.0638 -0.02 -0.1601 -0.0012 0.0735 -0.0283 0.4315
```



3.3 Downside Risk - Combined

Downside Risk Combined

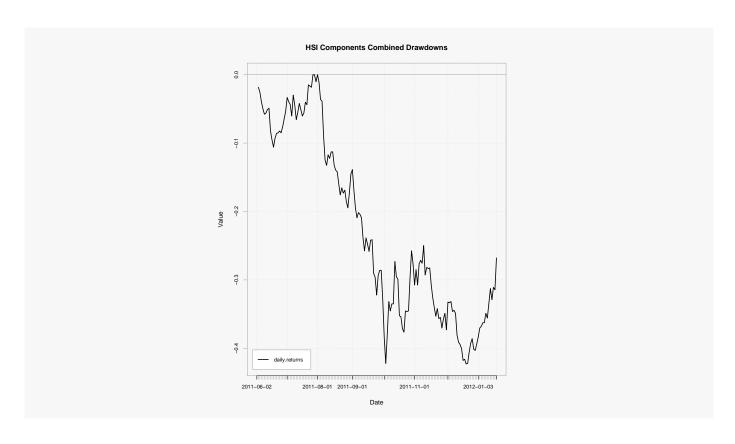
##	HSI Components dailyReturn	
## Semi Deviation	0.0261	
## Gain Deviation	0.0209	
## Loss Deviation	0.0177	
## Downside Deviation (MAR=210%)	0.0298	
## Downside Deviation (Rf=0%)	0.0269	
## Downside Deviation (0%)	0.0269	
## Maximum Drawdown	0.4229	
## Historical VaR (95%)	-0.0438	
## Historical ES (95%)	-0.0630	
## Modified VaR (95%)	-0.0438	
## Modified ES (95%)	-0.0556	

3.4 Drawdowns - Combined

 $Drawdowns\ Combined$

Warning message: Only 3 available in the data.

##	From	Trough	То	Depth	Length	То	Trough	Recovery
## 1	2011-08-02	2011-12-19	<na></na>	-0.4229	119		98	NA
## 2	2011-06-03	2011-06-20	2011-07-28	-0.1060	38		11	27
## 3	2011-07-29	2011-07-29	2011-08-01	-0.0104	2		1	1



3.5 Downside Deviation - Combined

Downside Deviation Combined

```
## HSI Components
## Downside Deviation (MAR = 0%) 0.02685
```

3.6 Autocorrelation Coefficients - Distinct

```
##
             rho1
                     rho2
                            rho3
                                   rho4
                                          rho5
                                                  rho6 Q(6) p-value
## X0001.HK 0.0509 -0.0629
                          0.0194 -0.0319
                                        0.0086
                                                            0.3990
## X0002.HK -0.1246 -0.0458 -0.0120
                                 0.0281
                                        0.0204 -0.0338
                                                            0.0179
## X0003.HK -0.0975 -0.0160 -0.0231
                                 0.0492
                                        0.0165
                                               0.0279
                                                            0.1054
## X0004.HK
           0.0079 -0.0354 -0.0310 -0.0281
                                        0.0888 -0.0425
                                                            0.1358
## X0005.HK -0.0249 -0.0262
                          0.0593
                                 0.0327 -0.0490 0.0295
                                                            0.3203
## X0006.HK -0.0898 -0.0644
                          0.0191 -0.0152 0.0100 -0.0718
                                                            0.0322
          ## X0011.HK
                                                            0.0074
## X0012.HK
           0.0692 -0.0238 -0.0489 -0.0080 0.0472 0.0086
                                                            0.2602
           0.0015 0.0312
                         ## X0013.HK
                                                            0.9225
## X0016.HK
           0.0451 -0.0569
                          0.0241 -0.0068 0.0413 0.0182
                                                            0.4179
## X0017.HK
           0.0758
                  0.0163
                          0.0068 0.0230 0.0456 -0.0201
                                                            0.3282
## X0019.HK
           0.0469
                  0.0451 -0.0274 -0.1075 -0.0092
                                               0.0253
                                                            0.0402
## X0023.HK
           0.0864 -0.0084 -0.0090 0.0001 -0.0454 -0.0370
                                                            0.2090
## X0066.HK -0.0751 0.0016 0.0558 -0.0251 -0.0104 -0.0162
                                                            0.2831
## X0083.HK
          0.1015 -0.0610 -0.0394 0.0033 0.0475
                                               0.0055
                                                            0.0341
## X0101.HK -0.0681 -0.0277
                          0.0175 -0.0437 -0.0552
                                               0.0181
                                                            0.2109
## X0144.HK
          0.0655 -0.0103
                          0.0027 -0.0504 -0.1086 -0.0001
                                                            0.0263
## X0151.HK -0.0168 -0.0291 -0.0883 -0.0973 0.0108 -0.0031
                                                            0.0281
           ## X0267.HK
                                               0.0432
                                                            0.0062
                                        0.0092 -0.0031
## X0291.HK -0.0364 -0.0195
                          0.0090 -0.0440
                                                            0.8205
## X0293.HK 0.0239 -0.0466 -0.0720 -0.0559 0.0741 0.0693
                                                            0.0122
## X0322.HK -0.0121 0.0346 -0.0902 -0.0004 -0.0195 -0.0236
                                                            0.2417
## X0330.HK 0.0419 0.1218 -0.0170 0.0399 -0.0102 -0.0195
                                                            0.0250
## X0386.HK -0.0220 -0.0235 -0.0393 -0.0183 -0.0096 0.0346
                                                            0.7817
## X0388.HK
           0.1700
## X0494.HK
           0.0541 -0.0072 -0.0035 -0.0432 -0.1579 -0.0043
                                                            0.5516
           0.0771 -0.0511 -0.0501 -0.0492 -0.0075
## X0688.HK
                                               0.0091
                                                            0.1094
## X0700.HK
           0.0257 -0.0978 -0.0002 -0.0901 0.0053
                                               0.0359
                                                            0.0189
## X0762.HK -0.0467 -0.0667 -0.0311 -0.0662 0.0186 -0.0136
                                                            0.1411
## X0836.HK -0.0539 -0.0390
                          0.0019 0.0066 -0.0112 -0.0148
                                                            0.7213
## X0857.HK
           0.0446 -0.0128
                         0.0399 -0.0065 -0.0065
                                               0.0067
                                                            0.8147
           0.0431 -0.0505 -0.0128 -0.0309 -0.0591
## X0883.HK
                                                            0.3314
           0.0032 0.0026
                          0.0205 -0.0574 -0.0333 -0.0318
## X0939.HK
                                                            0.6125
## X0941.HK -0.0151 -0.0179
                          0.2706
## X1044.HK -0.0346 -0.0455 -0.0980 -0.0581 -0.0405 0.0122
                                                            0.0299
## X1088.HK
           0.5946
## X1109.HK
           0.1327
           0.0739 0.0493 -0.0049 -0.0672 0.0069 0.0344
## X1199.HK
                                                            0.1085
## X1299.HK -0.0157 -0.0874
                         0.0173 -0.0775 -0.1147 -0.0060
                                                            0.2029
## X1398.HK
           0.0242 -0.0017
                          0.0663 -0.0253 -0.0243 -0.0332
                                                            0.4711
           0.0056 -0.0820 -0.0840 -0.0273 -0.0369 -0.0347
## X1880.HK
                                                            0.0420
## X1898.HK
           0.0973 0.0169
                          0.0031 0.0025 -0.0481 -0.0165
                                                            0.1518
           0.0701 -0.0478 -0.0691 -0.0416  0.0661  0.0107
## X2318.HK
                                                            0.0311
## X2388.HK
           0.0719 0.0273
                          0.0573 -0.0015 -0.0401 -0.0156
                                                            0.2079
           0.0663 -0.0324 -0.0271 0.0010 0.0066 0.0099
## X2600.HK
                                                            0.5683
## X2628.HK -0.0002 -0.0229 0.0369 -0.0630 -0.0057 -0.0021
                                                            0.6094
```

```
## X3328.HK 0.0249 0.0339 -0.0039 -0.0631 0.0049 -0.0122 0.6060
## X3988.HK 0.0410 -0.0208 0.0418 -0.0461 -0.0083 -0.0671 0.2334
```

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%) 0.0111 0.0152 0.0215 0.0194 0.0198
##
                                0017.HK 0019.HK 0023.HK 0066.HK 0083.HK
## Downside Deviation (MAR = 0%) 0.0246 0.021 0.0207 0.0133 0.0257
##
                                0101.HK 0144.HK 0151.HK 0267.HK 0291.HK
## Downside Deviation (MAR = 0%) 0.0255
                                         0.027 0.0218 0.0257
                                                                 0.023
##
                                0293.HK 0322.HK 0330.HK 0386.HK 0388.HK
## Downside Deviation (MAR = 0\%) 0.0215 0.0202 0.0356 0.0208
                                0494.HK 0688.HK 0700.HK 0762.HK 0836.HK
##
## Downside Deviation (MAR = 0%) 0.0345 0.0261 0.0248 0.0227 0.0205
                                0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
##
## Downside Deviation (MAR = 0%) 0.0211 0.0242 0.0212
                                                       0.016 0.0205
##
                                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 0.0302
                                                 0.027 0.0201
##
                                2628.HK 3328.HK 3988.HK
## Downside Deviation (MAR = 0%) 0.022 0.0225 0.0219
```

4 General Statistics

 $Statistics\ Distinct$

##		Observations					Arithmetic Mean
	X0001.HK.Close	758	12	56.00	91.162		99.853
	X0002.HK.Close	758	12	51.10	52.550	56.975	59.115
	X0003.HK.Close	758	12	10.78	17.180	18.080	17.581
	X0004.HK.Close	758	12	15.20	36.550	41.550	41.707
	X0005.HK.Close	758	12	33.00	65.950	79.100	75.067
	X0006.HK.Close	758	12	41.10	43.413	47.025	48.852
	X0011.HK.Close	758	12	67.00		110.750	109.620
	X0012.HK.Close	758	12	23.75	42.650	48.575	46.998
	X0013.HK.Close	758	12	36.40	52.400	57.575	63.760
	X0016.HK.Close	758	12	55.80		111.500	108.102
	X0017.HK.Close	758	12	6.20	10.025	13.580	12.799
##	X0019.HK.Close	758	12	42.90	84.763		92.739
##	X0023.HK.Close	758	12	12.34	26.500	28.875	28.138
##	X0066.HK.Close	758	12	16.14	25.100	26.875	26.026
##	X0083.HK.Close	758	12	5.60	11.785	13.680	13.073
	X0101.HK.Close	758	12	13.66	25.500	29.175	28.631
	X0144.HK.Close	758	12	12.20	23.050	26.300	25.919
	X0151.HK.Close	758	12	2.77	4.622	6.140	5.797
	X0267.HK.Close	758	12	7.18	14.200	17.430	17.121
	X0291.HK.Close	758	12	10.66	23.262	27.925	26.037
	X0293.HK.Close	758	12	6.98	12.540	14.590	15.165
	X0322.HK.Close	758	12	8.27	16.095	19.170	18.087
	X0330.HK.Close	758	12	7.93	34.050	42.650	39.742
	X0386.HK.Close	758	12	3.65	6.180	6.760	6.763
	X0388.HK.Close	758	12	54.60		135.950	136.498
	X0494.HK.Close	159		11.60	13.580	14.400	14.457
	X0688.HK.Close	758	12	9.41	14.180	15.490	15.206
	X0700.HK.Close	767	3	41.80		154.800	146.972
	X0762.HK.Close	765	5	8.31	9.630	10.920	11.841
	X0836.HK.Close	758	12	11.10	14.200	15.360	15.447
	X0857.HK.Close	758	12	5.10	8.670	9.330	9.258
	X0883.HK.Close	758	12	6.08	11.025	13.130	13.493
	X0939.HK.Close	758	12	3.66	5.582		6.112
	X0941.HK.Close	758	12	63.00	73.213	75.750	75.569
	X1044.HK.Close	770	0	24.25	46.513	58.400	55.851
	X1088.HK.Close	758		13.90	29.863		31.565
	X1109.HK.Close		12	7.50	12.860		14.405
	X1199.HK.Close	758	12	5.40	9.360	10.880	11.107
	X1299.HK.Close	305		19.86	22.650		24.296
	X1398.HK.Close	758	12	3.03	4.940	5.740	5.462
	X1880.HK.Close	758	12	2.98	7.952		10.987
	X1898.HK.Close	758	12	4.43	9.450	10.610	10.453
	X2318.HK.Close	758	12	30.35	57.862		65.442
	X2388.HK.Close	758	12	6.30	16.660	18.360	18.664
	X2600.HK.Close	758	12	3.20	5.902	7.065	6.729
	X2628.HK.Close	758	12	17.24	26.100		29.800
	X3328.HK.Close	758	12	4.17	6.320	8.020	7.623
	X3988.HK.Close	758	12	1.84	3.040	3.940	3.670
##							CL Mean (0.95)
	X0001.HK.Close	98.46		114.000		0.5950	98.685
	X0002.HK.Close	58.75	8	64.050		0.2413	58.642
	X0003.HK.Close	17.44	13	19.000		0.0766	17.431
##	X0004.HK.Close	39.95	53	51.337	62.00	0.4068	40.909

```
## X0005.HK.Close
                            74.016
                                       83.150
                                                 98.00
                                                        0.4318
                                                                          74.219
## X0006.HK.Close
                            48.498
                                       52.837
                                                 64.80
                                                         0.2212
                                                                          48.418
## X0011.HK.Close
                           108.841
                                      119.850
                                                134.00
                                                        0.4627
                                                                         108.712
## X0012.HK.Close
                            46.166
                                       53.237
                                                 60.50
                                                        0.3013
                                                                          46.407
## X0013.HK.Close
                            61.804
                                       78.350
                                                 95.90
                                                         0.5849
                                                                          62.612
## X0016.HK.Close
                           106.341
                                      118.800
                                                146.30
                                                         0.6638
                                                                         106.799
## X0017.HK.Close
                            12.342
                                                 18.54
                                       15.360
                                                         0.1200
                                                                          12.564
## X0019.HK.Close
                            90.251
                                      109.500
                                                136.40
                                                         0.7327
                                                                          91.300
## X0023.HK.Close
                            27.592
                                       32.188
                                                 35.90
                                                         0.1858
                                                                          27.774
                            25.796
## X0066.HK.Close
                                       28.288
                                                 31.15
                                                         0.1197
                                                                          25.791
## X0083.HK.Close
                            12.803
                                       14.800
                                                 18.56
                                                         0.0916
                                                                          12.893
## X0101.HK.Close
                            28.022
                                       32.475
                                                 40.30
                                                         0.2054
                                                                          28.227
                            25.369
                                       28.950
                                                 37.55
## X0144.HK.Close
                                                         0.1859
                                                                          25.554
## X0151.HK.Close
                             5.644
                                        6.938
                                                         0.0497
                                                  8.19
                                                                           5.699
## X0267.HK.Close
                            16.619
                                       20.637
                                                 24.40
                                                         0.1456
                                                                          16.835
## X0291.HK.Close
                            25.004
                                       30.837
                                                 35.25
                                                         0.2407
                                                                          25.565
## X0293.HK.Close
                            14.626
                                       18.360
                                                 24.05
                                                         0.1490
                                                                          14.872
## X0322.HK.Close
                            17.440
                                       20.700
                                                 25.95
                                                         0.1639
                                                                          17.765
## X0330.HK.Close
                            36.028
                                       50.800
                                                 64.30
                                                         0.5222
                                                                          38.717
## X0386.HK.Close
                             6.688
                                        7.560
                                                  9.15
                                                         0.0378
                                                                           6.689
## X0388.HK.Close
                           132.527
                                      161.275
                                                197.50
                                                         1.1045
                                                                         134.329
## X0494.HK.Close
                            14.405
                                       15.420
                                                 17.92
                                                         0.1014
                                                                          14.257
## X0688.HK.Close
                                                 19.44
                                                         0.0718
                            15.075
                                       16.660
                                                                          15.065
## X0700.HK.Close
                           136.728
                                       178.950
                                                225.00
                                                         1.7114
                                                                         143.613
## X0762.HK.Close
                            11.612
                                       13.660
                                                 17.40
                                                        0.0911
                                                                          11.662
## X0836.HK.Close
                            15.361
                                       16.660
                                                 20.15
                                                         0.0612
                                                                          15.327
## X0857.HK.Close
                             9.156
                                       10.095
                                                 12.36
                                                        0.0501
                                                                           9.160
## X0883.HK.Close
                                                 20.95
                            13.053
                                       16.420
                                                        0.1257
                                                                          13.246
## X0939.HK.Close
                             6.044
                                        6.830
                                                  8.28
                                                         0.0344
                                                                           6.045
## X0941.HK.Close
                            75.463
                                       77.950
                                                 91.45
                                                        0.1457
                                                                          75.282
## X1044.HK.Close
                            53.663
                                       67.700
                                                 78.25
                                                         0.5167
                                                                          54.837
## X1088.HK.Close
                            30.901
                                       35.250
                                                 40.80
                                                         0.2132
                                                                          31.147
## X1109.HK.Close
                            14.162
                                       16.400
                                                 20.00
                                                         0.0954
                                                                          14.218
## X1199.HK.Close
                            10.866
                                       12.720
                                                 16.76
                                                        0.0865
                                                                          10.937
## X1299.HK.Close
                            24.221
                                       26.100
                                                 29.55
                                                         0.1127
                                                                          24.074
## X1398.HK.Close
                             5.397
                                        5.990
                                                  7.03
                                                         0.0316
                                                                           5.400
## X1880.HK.Close
                                       14.260
                            10.219
                                                 17.54
                                                         0.1409
                                                                          10.710
## X1898.HK.Close
                                       11.780
                                                 15.86
                                                         0.0801
                            10.212
                                                                          10.296
## X2318.HK.Close
                            63.933
                                       76.550
                                                 94.30
                                                         0.4938
                                                                          64.472
## X2388.HK.Close
                                       22.950
                            17.866
                                                 28.95
                                                         0.1875
                                                                          18.296
## X2600.HK.Close
                                        7.880
                                                 10.66
                                                         0.0622
                             6.516
                                                                           6.607
## X2628.HK.Close
                            29.174
                                       34.538
                                                 41.00
                                                         0.2160
                                                                          29.376
## X3328.HK.Close
                             7.471
                                        8.727
                                                 10.56
                                                         0.0563
                                                                           7.512
##
   X3988.HK.Close
                             3.609
                                         4.150
                                                  5.00
                                                         0.0260
                                                                           3.619
##
                                                 Stdev Skewness Kurtosis
                   UCL Mean (0.95)
                                     Variance
## X0001.HK.Close
                            101.021
                                     268.3861 16.3825
                                                         -0.0738
                                                                  -0.1846
## X0002.HK.Close
                             59.589
                                      44.1201
                                                6.6423
                                                          0.4167
                                                                   -1.2147
## X0003.HK.Close
                             17.732
                                       4.4487
                                                2.1092
                                                         -1.5853
                                                                   1.9214
## X0004.HK.Close
                             42.506
                                     125.4240 11.1993
                                                         -0.4479
                                                                  -0.2726
                                     141.3374 11.8885
                                                         -0.8170
                                                                   0.2239
## X0005.HK.Close
                             75.914
## X0006.HK.Close
                             49.286
                                      37.1010 6.0911
                                                          0.7077
                                                                  -0.7094
## X0011.HK.Close
                            110.528
                                     162.2890 12.7393
                                                         -0.5604
                                                                   0.0108
## X0012.HK.Close
                             47.590
                                      68.8216 8.2959
                                                         -0.9030
                                                                   0.2406
## X0013.HK.Close
                             64.909
                                     259.2988 16.1028
                                                          0.3947
                                                                  -1.0034
## X0016.HK.Close
                            109.405
                                     333.9984 18.2756
                                                         -0.8324
                                                                   0.5655
## X0017.HK.Close
                             13.035
                                      10.9131 3.3035
                                                         -0.5855
                                                                  -0.8345
                                                                  -0.0220
## X0019.HK.Close
                             94.177
                                     406.9333 20.1726
                                                         -0.4759
```

```
## X0023.HK.Close
                           28.503
                                    26.1691 5.1156
                                                     -1.1846
                                                                0.9482
## X0066.HK.Close
                           26.261
                                    10.8686
                                             3.2968
                                                      -1.3512
                                                                1.1234
## X0083.HK.Close
                           13.253
                                     6.3614
                                             2.5222
                                                      -1.0164
                                                                0.6681
                                                      -0.5333
## X0101.HK.Close
                           29.034
                                    31.9871 5.6557
                                                               -0.0467
## X0144.HK.Close
                           26.284
                                    26.2059 5.1192
                                                      -0.5015
                                                                0.2486
                                                      -0.5082
## X0151.HK.Close
                            5.894
                                     1.8738 1.3689
                                                               -0.8398
## X0267.HK.Close
                           17.407
                                    16.0643 4.0080
                                                      -0.4671
                                                               -0.6027
## X0291.HK.Close
                                                      -0.9891
                                                               -0.1849
                           26.510
                                    43.9225
                                             6.6274
## X0293.HK.Close
                           15.457
                                    16.8209
                                             4.1013
                                                       0.1249
                                                               -0.7943
## X0322.HK.Close
                           18.409
                                    20.3570 4.5119
                                                      -0.7699
                                                               -0.2306
## X0330.HK.Close
                           40.767
                                   206.7032 14.3772
                                                      -0.7561
                                                               -0.3193
## X0386.HK.Close
                                                      -0.6294
                            6.838
                                      1.0826 1.0405
                                                                0.4676
## X0388.HK.Close
                          138.666
                                   924.6688 30.4084
                                                      -0.5519
                                                                0.2364
## X0494.HK.Close
                           14.658
                                      1.6364 1.2792
                                                       0.1334
                                                               -0.3314
## X0688.HK.Close
                                                      -0.7316
                           15.347
                                     3.9094 1.9772
                                                                0.0339
## X0700.HK.Close
                          150.332 2246.4990 47.3972
                                                      -0.6754
                                                               -0.3119
## X0762.HK.Close
                           12.020
                                     6.3488 2.5197
                                                       0.7677
                                                               -0.8509
## X0836.HK.Close
                           15.567
                                     2.8376 1.6845
                                                       0.1344
                                                               -0.3666
                                                      -0.7620
## X0857.HK.Close
                            9.357
                                     1.9046 1.3801
                                                                0.7948
## X0883.HK.Close
                           13.740
                                    11.9761 3.4606
                                                      -0.0313
                                                               -0.7294
                                                      -0.7141
## X0939.HK.Close
                            6.180
                                     0.8956 0.9464
                                                               -0.0135
## X0941.HK.Close
                           75.855
                                    16.0917 4.0114
                                                       0.0415
                                                                0.7636
## X1044.HK.Close
                                                      -0.7197
                           56.865
                                   205.5348 14.3365
                                                               -0.6154
## X1088.HK.Close
                           31.984
                                    34.4502 5.8694
                                                      -1.3440
                                                                1.3029
## X1109.HK.Close
                                                      -0.4295
                           14.593
                                     6.8961
                                             2.6260
                                                               -0.2291
## X1199.HK.Close
                                                       0.0858
                           11.277
                                     5.6729
                                             2.3818
                                                               -0.5639
## X1299.HK.Close
                           24.518
                                     3.8757
                                             1.9687
                                                       0.3994
                                                               -0.9061
## X1398.HK.Close
                            5.524
                                     0.7557
                                             0.8693
                                                      -0.9444
                                                                0.2943
## X1880.HK.Close
                           11.263
                                    15.0503 3.8795
                                                      -0.4159
                                                               -0.9643
## X1898.HK.Close
                           10.610
                                     4.8636 2.2053
                                                      -0.5248
                                                                0.2611
## X2318.HK.Close
                                                      -0.2155
                           66.411
                                   184.8564 13.5962
                                                               -0.3745
## X2388.HK.Close
                           19.032
                                    26.6448 5.1619
                                                      -0.3865
                                                               -0.2971
## X2600.HK.Close
                            6.851
                                     2.9290
                                             1.7114
                                                      -0.4624
                                                               -0.6415
## X2628.HK.Close
                           30.224
                                    35.3490 5.9455
                                                      -0.4264
                                                               -0.8907
## X3328.HK.Close
                            7.733
                                     2.3991 1.5489
                                                      -0.5160
                                                               -0.8656
## X3988.HK.Close
                                   0.5129 0.7162 -0.8227 -0.3495
                            3.721
```

4.1 Higher Moments - Distinct

```
0001.HK 0002.HK 0003.HK 0004.HK 0005.HK 0006.HK 0011.HK
##
                            0.0000 0.0000
                                              0.000
                                                       0.000
                                                             0.0000
## CoSkewness
                    0.0000
                                                                      0.0000
                                              0.000
## CoKurtosis
                    0.0000
                            0.0000
                                    0.0000
                                                       0.000
                                                              0.0000
                                                                      0.0000
                    0.9900 0.1501
                                              1.109
## Beta CoVariance
                                     0.3797
                                                       1.121
                                                             0.1169
                                                                      0.6394
                    0.9951 -0.5404 -0.4025
                                              1.831
                                                       0.967 -0.1644
                                                                      0.9716
## Beta CoSkewness
## Beta CoKurtosis
                    0.9990 0.0869 0.3599
                                              1.120
                                                       1.280
                                                              0.0897
                                                                      0.7202
                   0012.HK 0013.HK 0016.HK 0017.HK 0019.HK 0023.HK 0066.HK
##
                     0.000
                            0.0000
                                    0.0000
                                             0.0000
                                                     0.0000
## CoSkewness
                                                              0.0000
                                                              0.0000
                     0.000
                             0.0000
                                    0.0000
                                             0.0000
                                                     0.0000
## CoKurtosis
                                                                      0.0000
## Beta CoVariance
                                             1.1312
                     1.023
                             0.9492
                                    1.0037
                                                     0.7801
                                                              0.9389
                                                                      0.5089
## Beta CoSkewness
                     1.993
                             0.1359
                                     1.3508
                                             0.6581
                                                     1.4031
                                                             1.8216
                                                                      0.2500
  Beta CoKurtosis
                     1.076
                            0.9009
                                    0.9864
                                             1.1269
                                                     0.7972
                                                             0.9852
                                                                      0.4532
##
                   0083.HK 0101.HK 0144.HK 0151.HK 0267.HK 0291.HK 0293.HK
                                            0.0000
                                                    0.0000 0.0000
## CoSkewness
                     0.000
                              0.000
                                      0.000
                                                                     0.0000
## CoKurtosis
                     0.000
                              0.000
                                      0.000
                                             0.0000
                                                     0.0000
                                                             0.0000
                                                                      0.0000
## Beta CoVariance
                     1.167
                              1.098
                                      1.310
                                             0.4273
                                                     1.0786
                                                             0.8813
                                                                      0.7716
## Beta CoSkewness
                     1.224
                              2.778
                                      1.512 -1.4557
                                                     1.2978
                                                              0.1662
                                                                      1.0449
## Beta CoKurtosis
                                             0.3349
                     1.172
                              1.167
                                      1.208
                                                     0.9846
                                                              0.7633
                                                                      0.7553
##
                   0322.HK 0330.HK 0386.HK 0388.HK 0494.HK 0688.HK 0700.HK
## CoSkewness
                    0.0000
                             0.0000
                                     0.0000
                                              0.000
                                                       0.000
                                                               0.000
                                                                      0.0000
## CoKurtosis
                                     0.0000
                    0.0000
                            0.0000
                                              0.000
                                                       0.000
                                                               0.000
                                                                      0.0000
## Beta CoVariance
                    0.3498
                            0.9389
                                     0.9559
                                              1.159
                                                       1.234
                                                               1.185
                                                                      0.9345
## Beta CoSkewness -0.1755 -0.5765 -0.0712
                                              1.800
                                                               3.692
                                                     -1.377
                                                                      1.5934
## Beta CoKurtosis
                    0.3079
                            0.8980
                                    0.8894
                                              1.145
                                                       1.034
                                                               1.263
                                                                      0.8985
##
                   0762.HK 0836.HK 0857.HK 0883.HK 0939.HK 0941.HK 1044.HK
                                             0.0000
## CoSkewness
                    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 0.7034
                            0.5578
                                     1.1008
                                             1.2827
                                                     1.0618
                                                              0.7092
                                                                      0.4646
## Beta CoSkewness -0.4802 -0.7369
                                    0.5415
                                             0.8816
                                                     0.6076
                                                             0.6991
                                                                      0.0085
## Beta CoKurtosis 0.5409 0.4932 1.0085
                                             1.2091
                                                              0.7032
                                                     1.0417
                                                                      0.3956
##
                   1088.HK 1109.HK 1199.HK 1299.HK 1398.HK 1880.HK 1898.HK
                    0.0000
                              0.000
                                    0.0000
                                              0.000
                                                     0.0000
                                                              0.0000
## CoSkewness
                                                                       0.000
## CoKurtosis
                    0.0000
                              0.000
                                     0.0000
                                              0.000
                                                     0.0000
                                                              0.0000
                                                                       0.000
## Beta CoVariance
                    1.2171
                              1.162
                                     1.3316
                                              0.825
                                                     1.1263
                                                              0.8255
                                                                       1.496
                    0.9715
                              3.358
                                     0.7834
                                              1.919
## Beta CoSkewness
                                                     0.9763
                                                              0.2010
                                                                       0.959
  Beta CoKurtosis
##
                                     1.2567
                                              0.986
                                                     1.0661
                                                                       1.388
                    1.0929
                              1.141
                                                              0.7690
##
                   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
                     1.327
                                      1.540
                                             1.0911
                             0.8767
                                                     1.1914
                                                              1.0334
## Beta CoSkewness
                     2.059
                             0.8425
                                      2.166
                                             0.8888
                                                     0.9864
                                                              0.2954
## Beta CoKurtosis
                     1.318 0.8492
                                      1.448
                                             1.0392
                                                    1.1840
```

4.2 Higher Moments - Combined

##		HSI Components to HSI Combined
##	CoSkewness	0.0000
##	CoKurtosis	0.0000
##	Beta CoVariance	1.1854
##	Beta CoSkewness	0.0248
##	Beta CoKurtosis	1.1252

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

 $^{^4} http://statmath.wu.ac.at/courses/optimization/Presentations/Nops+Thomas-sPCA1.pdf$

 $^{^5 {\}rm http://en.wikipedia.org/wiki/Factor analysis}$

5.1 PCA with stats package princomp function

```
## Importance of components:
##
                          Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6
## Standard deviation
                          5.1649 1.53777 1.19373 1.12202 1.07374 1.03320
## Proportion of Variance 0.5557 0.04927 0.02969 0.02623 0.02402 0.02224
## Cumulative Proportion 0.5557 0.60501 0.63470 0.66093 0.68495 0.70719
##
                           Comp.7 Comp.8 Comp.9 Comp.10 Comp.11 Comp.12
## Standard deviation
                          0.95584 0.95154 0.88521 0.86778 0.83024 0.80914
## Proportion of Variance 0.01903 0.01886 0.01632 0.01569 0.01436 0.01364
## Cumulative Proportion 0.72622 0.74508 0.76141 0.77710 0.79146 0.80510
##
                          Comp.13 Comp.14 Comp.15 Comp.16 Comp.17 Comp.18
## Standard deviation
                          0.78746 0.77603 0.74113 0.7364 0.691827 0.666841
## Proportion of Variance 0.01292 0.01255 0.01144 0.0113 0.009971 0.009264
## Cumulative Proportion 0.81802 0.83056 0.84201 0.8533 0.863274 0.872538
                           Comp.19 Comp.20 Comp.21 Comp.22 Comp.23
##
## Standard deviation
                          0.642771 0.635831 0.613164 0.597640 0.58909
## Proportion of Variance 0.008607 0.008423 0.007833 0.007441 0.00723
## Cumulative Proportion 0.881146 0.889568 0.897401 0.904842 0.91207
##
                           Comp.24 Comp.25 Comp.26 Comp.27
                                                              Comp.28
## Standard deviation
                          0.567758 0.554049 0.541060 0.526881 0.502316
## Proportion of Variance 0.006716 0.006395 0.006099 0.005783 0.005257
## Cumulative Proportion 0.918787 0.925183 0.931281 0.937065 0.942322
##
                           Comp.29 Comp.30 Comp.31 Comp.32 Comp.33
                          0.483719 0.474125 0.458314 0.454153 0.438315
## Standard deviation
## Proportion of Variance 0.004875 0.004683 0.004376 0.004297 0.004002
## Cumulative Proportion 0.947196 0.951879 0.956256 0.960553 0.964555
##
                           Comp.34 Comp.35 Comp.36 Comp.37 Comp.38
## Standard deviation
                          0.434195 0.422253 0.403266 0.389330 0.363497
## Proportion of Variance 0.003928 0.003715 0.003388 0.003158 0.002753
## Cumulative Proportion 0.968483 0.972197 0.975585 0.978743 0.981496
##
                           Comp.39 Comp.40 Comp.41 Comp.42 Comp.43
## Standard deviation
                          0.360233 0.353010 0.342367 0.320748 0.304258
## Proportion of Variance 0.002704 0.002596 0.002442 0.002143 0.001929
## Cumulative Proportion 0.984199 0.986795 0.989237 0.991381 0.993309
##
                           Comp.44 Comp.45 Comp.46 Comp.47
## Standard deviation
                          0.279439 0.268599 0.257921 0.24202 0.2140664
## Proportion of Variance 0.001627 0.001503 0.001386 0.00122 0.0009547
  Cumulative Proportion 0.994936 0.996439 0.997825 0.99905 1.0000000
##
## Loadings:
##
            Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
## X0001.HK -0.175
                                 -0.174
## X0002.HK
                    0.460
                                        -0.113
                                                0.172 -0.243
                                                              0.271
                          0.172 -0.254
## X0003.HK
                    0.354
                                         0.181
                                                       0.232
## X0004.HK -0.160 -0.108
                                 -0.124
                                                              0.123
                                                                     0.175
## X0005.HK -0.172
                                                       0.167
## X0006.HK
                    0.466 -0.124
                                        -0.171
                                                      -0.182
                                                              0.377
## X0011.HK -0.160
                                 -0.249
                                                0.148
                                                                     0.168
## X0012.HK -0.161
                                 -0.214
                                                       0.108
## X0013.HK -0.169
                                 -0.121
                                                0.162
## X0016.HK -0.170
                                 -0.168
                                                       0.197
## X0017.HK -0.138
                          -0.124 -0.190
                                                       0.158
                                                             0.216 - 0.371
## X0019.HK -0.114
                           0.171 - 0.170
                                               -0.125 -0.408 -0.282 -0.405
## X0023.HK -0.150
                           0.111
                                        -0.194 0.129 -0.226 -0.161 0.227
## X0066.HK -0.132 0.135 0.176 -0.203
                                              -0.120 -0.103 -0.116 0.216
```

```
0.117
## X0151.HK -0.102 -0.104 0.476 0.167 -0.193 0.197 0.179 -0.247
## X0267.HK -0.158 0.104
                                   -0.127
## X0291.HK -0.121
                                           0.164 -0.310
                              0.128 -0.273 -0.229
## X0293.HK -0.139 -0.153
## X0293.HK -0.139 -0.155

## X0322.HK -0.112 0.547 -0.140 0.130 0.152

## X0330.HK 0.466 -0.328 -0.286 0.385 0.192
                                       -0.291
## X0386.HK -0.130 0.246 -0.113 0.261 0.197
## X0388.HK -0.165 -0.162 -0.130
## X0688.HK -0.155 -0.154 -0.144 0.101 -0.269 0.188 0.173 0.233 -0.269 0.188 0.173 0.233
## X0700.HK -0.145 0.269 -0.204 0.118
## X0762.HK -0.131 0.153 0.122 0.284
                                              -0.132
0.617 0.369 -0.105 0.149
## X0939.HK -0.169
## X0941.HK -0.114 0.339 0.105
## X1044.HK -0.116 0.339 0.239
## X1088.HK -0.167 0.105
                    0.105
                                    -0.170 0.168
## X1109.HK -0.152 -0.212
## X1199.HK -0.161 -0.127 0.152
                                0.406 0.111
                                          0.117
## X1299.HK -0.138
                          -0.124
## X1398.HK -0.176
                 0.213
                                    ## X1880.HK -0.131
                                   -0.139 -0.176 0.118
## X1898.HK -0.162
## X1898.HK -0.162
## X2318.HK -0.165
## X2388.HK -0.165
## X2600.HK -0.155 -0.115
                            -0.101 -0.135 -0.151
                              -0.158 -0.115
                                    -0.134
                                    -0.201 0.117 0.128
## X2628.HK -0.152
                                    -0.101 -0.112
## X3328.HK -0.173
## X3988.HK -0.167
                                    -0.111 -0.150
## Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15 Comp.16 Comp.17
                          0.168
-0.200 -0.128 -0.171 -0.153
## X0005.HK
## X0006.HK 0.329 0.250 -0.122 0.240 0.134
## X0011.HK 0.106
                  -0.222
## X0012.HK -0.106
                                                     0.137
## X0013.HK 0.177
## X0016.HK
                                              -0.139 0.128
## X0017.HK 0.107 0.185 0.251 -0.201
## X0017.HK 0.107 0.165 0.261 0.261 ## X0019.HK 0.185 0.233 -0.105 0.195 0.160 -0.103
## X0023.HK -0.159 0.224
## X0066.HK -0.101 -0.182 -0.309 -0.307 0.266 -0.122
## X0083.HK -0.200 -0.220 -0.221 -0.103
                 0.225
                                 -0.263
0.127
0.155
## X0101.HK
## X0144.HK 0.122 0.127
## X0151.HK -0.170 0.137 0.155
## X0267.HK 0.163 -0.128
                                0.127
                                                    0.232
                                                    0.194
                                        -0.164 -0.137 -0.118
## X0291.HK -0.224 -0.486 -0.178 0.298 -0.440 0.207 -0.135
## X0293.HK -0.144 -0.262
                                                    0.131
## X0322.HK -0.283 0.371 0.206 -0.237 -0.256 -0.164
```

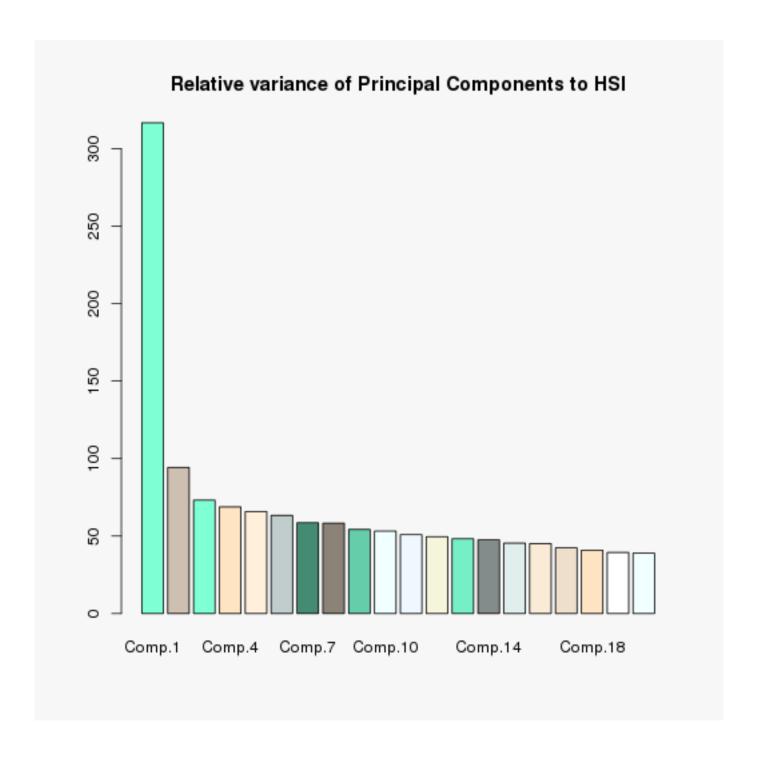
##	X0330.HK	0.115	-0.166		-0.178		0.184	-0.225	
шш	XUXXA HK				() 116		_() 141		-() ')') <
##	X0388.HK							0.137	-0.223
##	X0388.HK X0494.HK X0688.HK	0.320			0.385	-0.214			0.290
##	X0688.HK	-0.206	_0 127			0.212			0.200
##	X0700 HV	-0.200	-0.121	0 102	0 140	0.010	Λ 1EO		
##	X0700.HK	0.450	0 400	-0.103	-0.140	0 400	-0.158	0 004	
	X0762.HK								
	X0836.HK		0.292		0.113	-0.177		0.240	
##	X0857.HK		-0.120				-0.175	-0.176	-0.103
##	X0883.HK					-0.177			
##	X0883.HK X0939.HK			0.293	-0.123			0.101	0.120
	77.00.4.4 7777	0 110	0 000		0 4 4 0	0 110	0 0 1 1	0 1 10	0 001
##	X1044 HK	0.291		-0.271		-0.172		0.347	-0.117
##	X1088.HK X1109.HK	0.201		_0 125	0 110	0.1.2	0 175	_0.011	0.11.
ππ	X1000.IIK	0 000		0.125	0.113	0 020	0.175	-0.121	
##	X1109.HK	-0.222		-0.146	0.134	0.232			
##	X1199.HK				-0.146		-0.123		
##	X1299.HK	0.219	-0.152	0.118			0.198		
##	X1398.HK			0.252				0.134	
##	X1299.HK X1398.HK X1880.HK	0.272	-0.184			0.268			-0.166
##	X1898.HK	0.155		0.159	0.103	-0.138			
##	XJ318 HK		0 13/		0 136				
##	Х2388 НК	0.163		0.178	-0.125		0.185		
##	¥2600.1110	_0 151		0.110	0.120	0 190	0.100		_0_217
##	VOCOO III	0.131				0.100	0.004		0.217
##	77020.HK	-0.144		0 100			-0.234	0 100	-0.370
##	X2388.HK X2600.HK X2628.HK X3328.HK X3988.HK			0.160			0.102	0.192	
##	X3988.HK	-0.120		0.317			0.139	0.141	0.122
##		Comp.18	Comp.19	Comp.20	Comp.21	Comp.22	Comp.23	Comp.24	Comp.25
##	X0001.HK		-0.101						
##	X0002.HK					0.106		0.178	
	X0002.HK X0003.HK	-0.174	-0.274	-0.179	0.131				
##	X0003.HK					-0.233	0.134		
##	X0003.HK					-0.233	0.134		
## ## ##	X0003.HK X0004.HK X0005.HK			-0.136	0.128 -0.189	-0.233	0.134		
## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK	0.130		-0.136	0.128 -0.189	-0.233	0.134	-0.170	0 101
## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK	0.130	-0.108	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233		0.101
## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK	0.130 0.145	-0.108 -0.135	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233	-0.170	0.101
## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK	0.130 0.145	-0.108 -0.135	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233	-0.170	0.101
## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK	0.130 0.145	-0.108	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233	-0.170	0.101
## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK	0.130 0.145	-0.108 -0.135	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233	-0.170	
## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK X0017.HK	0.130 0.145	-0.108 -0.135	-0.136	0.128 -0.189 -0.130	-0.233 0.231 0.151	0.134 0.140 -0.233	-0.170 0.156	
## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK	0.130 0.145	-0.108 -0.135	-0.136 0.232 -0.137	0.128 -0.189 -0.130 -0.211	-0.233 0.231 0.151 -0.127 -0.118	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104	-0.378
## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK	0.130 0.145 -0.200	-0.108 -0.135	-0.136 0.232 -0.137	0.128 -0.189 -0.130 -0.211	-0.233 0.231 0.151 -0.127 -0.118	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157	-0.378 -0.182
## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK	0.130 0.145 -0.200 -0.119	-0.108 -0.135 0.122 0.277	-0.136 0.232 -0.137 -0.119 0.196	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195	-0.378 -0.182 0.129
## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK	0.130 0.145 -0.200 -0.119 0.150	-0.108 -0.135 0.122 0.277 -0.125	-0.136 0.232 -0.137 -0.119 0.196	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157	-0.378 -0.182 0.129
## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0023.HK X0083.HK X0083.HK	0.130 0.145 -0.200 -0.119 0.150 0.185	-0.108 -0.135 0.122 0.277 -0.125 0.169	-0.136 0.232 -0.137 -0.119 0.196 0.125	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106	-0.378 -0.182 0.129 0.255
## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380	-0.108 -0.135 0.122 0.277 -0.125 0.169	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195	-0.378 -0.182 0.129 0.255 -0.305
## ## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0083.HK X0101.HK X0144.HK X0151.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167	-0.136 0.232 -0.137 -0.119 0.196 0.125	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106	-0.378 -0.182 0.129 0.255 -0.305 0.265
## ## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0083.HK X0101.HK X0144.HK X0151.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305
## ## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0083.HK X0101.HK X0144.HK X0151.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126	0.128 -0.189 -0.130 -0.211 -0.291 -0.127	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182	0.134 0.140 -0.233 -0.183	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106	-0.378 -0.182 0.129 0.255 -0.305 0.265
## ## ## ## ## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0083.HK X0101.HK X0144.HK X0151.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182 -0.360	0.134 0.140 -0.233 -0.183 -0.150	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265
## ## # # # # # # # # # # # # # # # #	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0017.HK X0019.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0144.HK X0151.HK X0267.HK X0291.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182 -0.360	0.134 0.140 -0.233 -0.183 -0.150	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187
## ## ## ## ## ## ## ## ## ## ## ##	X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK X0019.HK X0023.HK X0066.HK X0083.HK X0083.HK X011.HK X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182 -0.360	0.134 0.140 -0.233 -0.183 -0.150	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0083.HK X0101.HK X0144.HK X0151.HK X0151.HK X0267.HK X0291.HK X0293.HK X0322.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182 -0.360	0.134 0.140 -0.233 -0.183 -0.150 -0.213	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0151.HK X0151.HK X0267.HK X0291.HK X0293.HK X0322.HK X0330.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323	0.134 0.140 -0.233 -0.183 -0.150 -0.213	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0151.HK X0151.HK X0267.HK X0291.HK X0293.HK X0330.HK X0388.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0016.HK X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK X0386.HK X0386.HK X0388.HK X0388.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140	-0.233 0.231 0.151 -0.127 -0.118 -0.101 0.134 0.182 -0.360 0.323	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102 0.233	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125 0.111 -0.101	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0017.HK X0019.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0151.HK X0151.HK X0151.HK X0267.HK X0291.HK X0293.HK X0386.HK X0386.HK X0386.HK X0388.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104 0.158 -0.145	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149 -0.124	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140 0.279	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323 0.194 -0.117 -0.157	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102 0.233 0.103	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125 0.111 -0.101	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109 0.214
#######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0017.HK X0019.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK X0388.HK X0388.HK X0494.HK X0494.HK X0494.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149 -0.124	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323 0.194 -0.117 -0.157 -0.396	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102 0.233 0.103 0.156	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125 0.111 -0.101	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109 0.214
#######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0017.HK X0019.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0151.HK X0151.HK X0151.HK X0267.HK X0291.HK X0293.HK X0386.HK X0386.HK X0386.HK X0388.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104 0.158 -0.145	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149 -0.124	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140 0.279	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323 0.194 -0.117 -0.157	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102 0.233 0.103	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125 0.111 -0.101	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109 0.214
######################################	X0003.HK X0004.HK X0006.HK X00011.HK X0012.HK X0013.HK X0017.HK X0019.HK X0019.HK X0023.HK X0066.HK X0083.HK X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK X0293.HK X0388.HK X0388.HK X0494.HK X0494.HK X0494.HK	0.130 0.145 -0.200 -0.119 0.150 0.185 -0.380 -0.154	-0.108 -0.135 0.122 0.277 -0.125 0.169 0.167 -0.189 0.262 -0.350 -0.111 -0.104 0.158 -0.145	-0.136 0.232 -0.137 -0.119 0.196 0.125 0.126 -0.128 -0.310 0.149 -0.124	0.128 -0.189 -0.130 -0.211 -0.291 -0.127 -0.149 0.251 -0.119 0.256 -0.140 0.279	-0.233 0.231 0.151 -0.151 -0.118 -0.101 0.134 0.182 -0.360 0.323 0.194 -0.117 -0.157 -0.396	0.134 0.140 -0.233 -0.183 -0.150 -0.213 0.248 0.155 0.102 0.233 0.103 0.156	-0.170 0.156 0.115 0.104 -0.157 -0.195 -0.106 0.125 0.111 -0.101	-0.378 -0.182 0.129 0.255 -0.305 0.265 -0.187 0.123 0.109 0.214

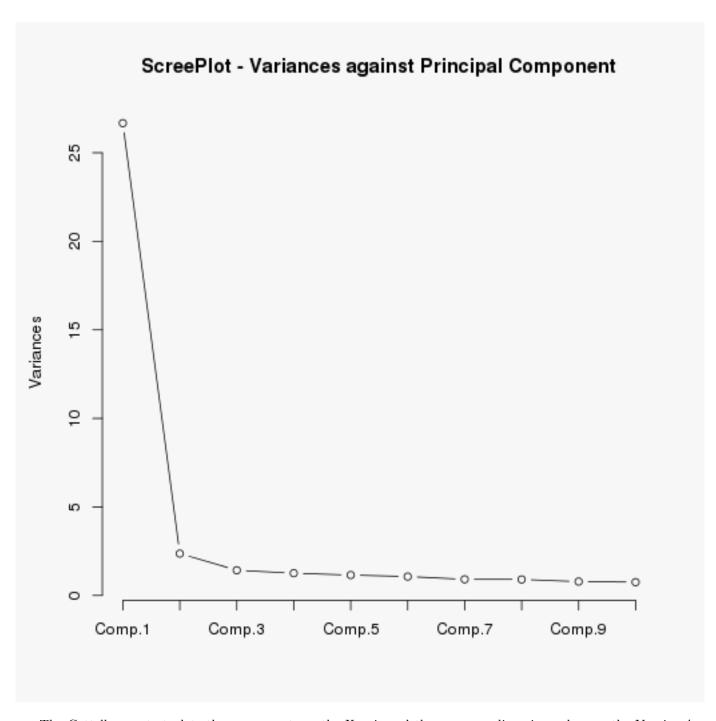
##	X0857.HK -0	0.111	-0.232			0.120	-0.216	0.131	
##	X0883.HK -	0.177	-0.217		-0.191			-0.122	
	X0939.HK			0.115	0.193		0.142		
##	X0941.HK	0.266	0.128		0.162				-0.249
##	X1044.HK	0.344	-0.281	0.196			-0.155	0.252	-0.214
	X1088.HK -		0.204			0.146	-0.250	0.144	
			-0.111					0.182	
	X1199.HK -				-0.332				
##	X1299.HK	0 233	0 110		-0 388	0.228	0 447		
	X1398.HK				0.000	0.220	0.111		
##	V1000 UV	Λ 111		0.124	0 115	0 105	V 33E	0 527	
##	V1000.IIK V	0.111			0.115	0.125	-0.555	0.027	
##	X1880.HK (X1898.HK X2318.HK (0 011		0 224		-0.200		-0.113	
	X2310.UV	0.211		-0.224	0 107		0 100	0.000	0 110
				-0.197				0.282	0.119
	X2600.HK -								
	X2628.HK	0.234	0.146	-0.360	-0.124	0.148			-0.311
	X3328.HK								0.154
	X3988.HK								
		-	-	Comp.28	Comp.29	Comp.30	Comp.31	Comp.32	-
	X0001.HK -								-0.113
##	X0002.HK -	0.298	0.338		0.167				
##	X0003.HK			0.127		-0.119			
##	X0004.HK -	0.114		-0.213	-0.496				-0.193
##	X0005.HK			0.180		-0.132		-0.132	-0.150
	X0006.HK (
	X0011.HK					0.253	-0.208	0.119	-0.366
	X0012.HK					-0.293			
	X0013.HK			-0.251	0.110	-0.384	0.300	-0.220	
##	X0016.HK -	0.142		-0.160	-0.100				
##	X0017.HK		-0.154			0.244			0.109
##	X0019.HK		0.159	0.201	-0.105				-0.148
##	X0023.HK		-0.295	0.226	-0.202	0.202	-0.147	-0.121	0.112
##	X0066.HK	0.109		0.101		-0.194	0.259		
##	X0083.HK	0.357		0.106	0.195	0.170		-0.276	0.222
##	X0101.HK			0.338		-0.127	0.118	0.388	
	X0144.HK				0.203				-0.102
	X0151.HK		-0.126			0.165	0.118	0.249	
	X0267.HK	0.264				0.169			
	X0291.HK			-0.115					
	X0293.HK			0.169	0.148	-0.103			
	X0322.HK					-0.167		-0.251	
	X0330.HK	0.123			-0.104	-0.141			
	X0386.HK			-0.158		0.214		-0.271	
	X0388.HK			0.100		0.102	-0.137		
				0.156		0.102	-0.137	-0.233	
	X0494.HK		0.137	0.100	0.110		0.237		-0.106
	X0700.HK			0.180	-0 136		-0.188		-0.130
	X0762.HK				-0.130	-0.249	0.100		0.130
	X0836.HK -			0.107		0.112	-0.137		-0.105
	X0857.HK -		_0_107						
			-0.127		-0.132				
	X0883.HK -0		0 1/1	0 115				0.116	-0.494
	X0939.HK			-0.115		0.405	0.179		
	X0941.HK -0	0.112	-0.101	-0.107		0.125	-0.110		
	X1044.HK	0 445		0.040			0.00=		0.000
	X1088.HK						0.225		0.298
			0.163				0.203		0.163
##	X1199.HK -	0.110	0.225		-0.221		-0.284	0.112	0.277

	** 1 0 2 2								
	X1299.HK							0.166	0.123
##	X1398.HK		0.162						-0.116
##	X1880.HK								
##	X1898.HK	-0.340	-0.220	-0.276	0.354				0.199
##	X2318.HK	0.113	0.116	-0.196			-0.199		
	X2388.HK					0.146		0.141	0.165
	X2600.HK	-0.107	-0.339	0.153	0.161		-0.201		
	X2628.HK						***	0.127	
	X3328.HK			0.157	0.200	0.118		0.121	
	X3988.HK	0.204		0.101		-0.156			
							C 20	C 10	C 11
##	V0001 III/	Comp.34	Comp.35	Comp.36	Comp.37	Comp.38	Comp.39	Comp.40	Comp.41
##	X0001.HK X0002.HK	0.450	0.400			0.373	0.404	0.102	-0.104
##	X0002.HK	-0.159	-0.103	0 404			0.164		-0.121
##	X0003.HK			0.121					
	X0004.HK								-0.102
	X0005.HK					0.350		-0.406	
	X0006.HK			-0.100			-0.102		
	X0011.HK					-0.110		-0.183	
##	X0012.HK		-0.278	-0.361	-0.192	-0.221			
	X0013.HK					0.110		0.138	
##	X0016.HK	0.254	-0.117	0.110		0.170			
	X0017.HK		-0.223		-0.124	-0.133			0.104
	X0019.HK		0.134		0.120	-0.107	-0.139		
	X0023.HK								0.176
									0.181
##	X0083.HK	-0.161	0.257	0.229	0.137	-0.107			
##	X0066.HK X0083.HK X0101.HK	-0.120	0.213	***	0.244	0.165		0.176	
##	X0144 HK	-0 360	0.210		0.211	0.100		0.1.0	
##	X0144.HK X0151.HK	_0.000		_0 1/3	0.120		0.212	0.185	0.101
	X0267.HK	-0.101				0.109		0.100	-0.303
	X0207.11K X0291.HK			-0.307	0.111	0.103			-0.303
			Λ 1EE						
	X0293.HK	0.134	-0.155						
	X0322.HK								
	X0330.HK		0 100	0 117		0.017		0.000	
	X0386.HK								
	X0388.HK	0.125	0.413	-0.214		-0.155		0.262	
	X0494.HK				-0.189			•	
	X0688.HK					0.176		-0.156	
	X0700.HK		-0.107	-0.152	0.109	-0.209			
	X0762.HK					0.176	-0.155		
	X0836.HK								
	X0857.HK	-0.193	0.180		-0.188			-0.159	
##	X0883.HK			0.228		-0.134		0.199	
##	X0939.HK	0.271				-0.119	0.240	-0.176	0.256
##	X0941.HK	0.152	0.219						-0.177
	X1044.HK			0.117	0.161				
	X1088.HK	0.338	-0.240	0.106	0.266	-0.123	0.212	-0.138	0.109
	X1109.HK		0.103	-0.117		-0.164			
	X1199.HK	0.279	0.102	0.220					-0.237
	X1299.HK			-0.225		-0.126			
	X1398.HK		-0.162		0.131				0.262
	X1880.HK				-0.164				
	X1898.HK	-0.132	0.145		0.177	-0.164	-0.165	-0.140	0.141
	X2318.HK		0.140	0.213	-0.244	J.101	0.490	0.110	V.111
	X2318.11K	0.000	0.137	0.215	-0.244	0.249	-0.284		
	X2600.HK		0.131	0.162	0.505	0.243	0.213		
	X2600.HK		-0.163	0.162					0.143
##	VZOZO.UV		-0.103	0.100			-0.183		0.143

```
## X3328.HK
                   -0.342
                                    ## X3988.HK
                                          -0.216
                                                           0.286 -0.334
##
           Comp.42 Comp.43 Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## X0001.HK 0.291 -0.184 0.220
                                   0.248 0.414 0.434
                    0.130
                            0.159
## X0002.HK
                                                          -0.137
## X0003.HK
                    0.121
## X0004.HK -0.135
                   0.244
                                                          -0.118
## X0005.HK
                    0.202
                                    0.117 -0.281
                                                          -0.132
## X0006.HK
                   -0.130
## X0011.HK -0.303
                  -0.215
                                   -0.104
                                                   0.110
## X0012.HK
                           -0.236
                                           0.186
                                                 -0.116
                                                           0.180
## X0013.HK
                    0.127
                                   -0.422
                                          -0.116
                                                           0.267
## X0016.HK
                            0.257
                                  -0.122
                                          -0.334 -0.274 -0.281
## X0017.HK
                   -0.114 -0.107
                                   0.123
## X0019.HK
## X0023.HK
                           -0.122 -0.223
## X0066.HK
                   -0.174
                                    0.123
## X0083.HK 0.104
                    0.202
## X0101.HK -0.178
                           -0.121
## X0144.HK 0.113
                                                          -0.129
## X0151.HK -0.171
                    0.146
## X0267.HK 0.111
                                          -0.117
## X0291.HK
## X0293.HK -0.120
                                           -0.104
## X0322.HK
                   -0.104
                           -0.118
## X0330.HK
## X0386.HK -0.271
                    0.123 -0.208
                                           0.109
## X0388.HK 0.120
                  -0.313
                                                  -0.163
## X0494.HK 0.134
                    0.121
                            0.124
## X0688.HK -0.204
                                           0.276 -0.464
                                                           0.193
## X0700.HK 0.107
## X0762.HK
                   -0.208
                                                           0.140
## X0836.HK
            0.108
                                                  -0.130
## X0857.HK 0.116
                            0.426 -0.176
                                           0.121
                   -0.121
                                                           0.125
## X0883.HK 0.182
                           -0.413
                                   0.167
                                          -0.123
## X0939.HK
                    0.141
                                   -0.388
                                           0.204
                                                   0.118 -0.352
## X0941.HK
                           -0.167
                                          -0.175
                                                           0.115
## X1044.HK
## X1088.HK 0.166
                                    0.292
## X1109.HK
                           -0.133
                                           -0.277
                                                   0.403 -0.134
## X1199.HK -0.249
                           -0.108
                                           0.218
                                                   0.109
                                                           0.137
## X1299.HK 0.176
                                          -0.136
## X1398.HK
                    0.118
                            0.191
                                          -0.292
                                                   0.292
                                                           0.629
## X1880.HK
                            0.150
## X1898.HK -0.265
                                    0.165
## X2318.HK
                   -0.285
                                           -0.166
                                                          -0.123
## X2388.HK 0.252
                    0.194
                           -0.195
                                    0.106
                                                  -0.215
## X2600.HK 0.233
                    0.215
                                                  -0.101
## X2628.HK
                    0.160
                                   -0.146
                                           0.186
## X3328.HK 0.136 -0.330
                                   -0.301 -0.121
                                                 -0.113 -0.134
## X3988.HK -0.244
                                  0.336
                   0.211
                            0.326
                                                  -0.158 -0.131
##
##
                 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
## Proportion Var 0.021 0.021 0.021 0.021 0.021 0.021 0.021 0.021
## Cumulative Var 0.021 0.042 0.063 0.083 0.104 0.125 0.146 0.167
##
                 Comp.9 Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15
```

```
## SS loadings
                1.000
                           1.000
                                   1.000
                                           1.000
                                                    1.000
                                                            1.000
                                                                    1.000
## Proportion Var 0.021
                           0.021
                                   0.021
                                            0.021
                                                    0.021
                                                            0.021
                                                                    0.021
## Cumulative Var 0.188
                           0.208
                                   0.229
                                           0.250
                                                    0.271
                                                            0.292
                                                                    0.312
##
                  Comp.16 Comp.17 Comp.18 Comp.19 Comp.20 Comp.21 Comp.22
                                    1.000
                                            1.000
                                                             1.000
                                                                     1.000
## SS loadings
                    1.000
                            1.000
                                                     1.000
## Proportion Var
                    0.021
                            0.021
                                    0.021
                                             0.021
                                                     0.021
                                                             0.021
                                                                     0.021
## Cumulative Var
                    0.333
                            0.354
                                    0.375
                                             0.396
                                                     0.417
                                                             0.438
                                                                     0.458
                  Comp.23 Comp.24 Comp.25 Comp.26 Comp.27 Comp.28 Comp.29
##
## SS loadings
                    1.000
                            1.000
                                    1.000
                                             1.000
                                                     1.000
                                                             1.000
                                                                     1.000
                                                     0.021
                    0.021
                            0.021
                                    0.021
                                             0.021
                                                             0.021
                                                                     0.021
## Proportion Var
                                                     0.562
## Cumulative Var
                    0.479
                            0.500
                                    0.521
                                             0.542
                                                             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
                                                             0.021
                                                                     0.021
## Proportion Var
                    0.021
                            0.021
                                    0.021
                                             0.021
                                                     0.021
                                    0.667
## Cumulative Var
                                                             0.729
                                                                     0.750
                    0.625
                            0.646
                                             0.688
                                                     0.708
##
                  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
                                                             0.875
                                                                     0.896
## Cumulative Var
                    0.771
                            0.792
                                    0.812
                                             0.833
                                                     0.854
##
                  Comp.44 Comp.45 Comp.46 Comp.47 Comp.48
## SS loadings
                    1.000
                            1.000
                                    1.000
                                             1.000
                                                     1.000
                                    0.021
## Proportion Var
                    0.021
                            0.021
                                             0.021
                                                     0.021
## Cumulative Var 0.917
                            0.938
                                    0.958
                                            0.979
                                                     1.000
```





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 Methods⁷ 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).

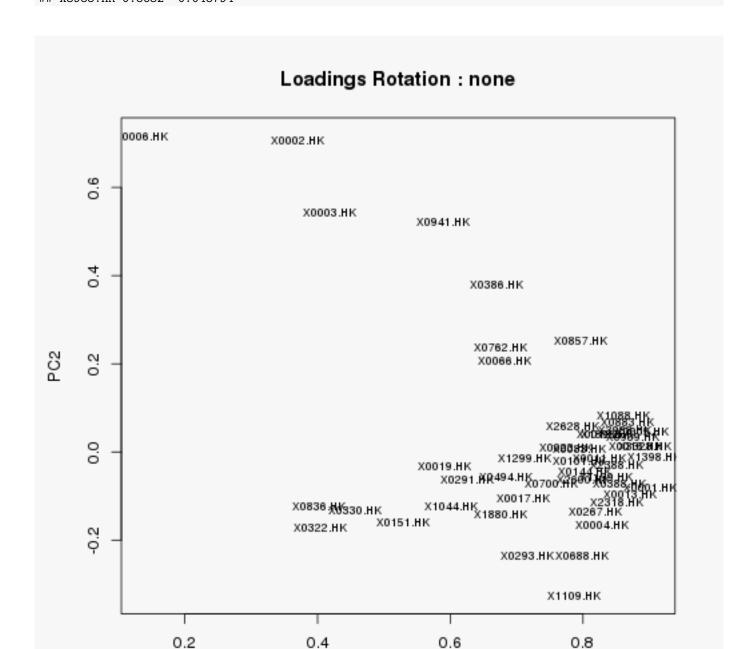
⁶from psyche package help(principal)

⁷http://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
                                        PC5
            item PC1
                      PC2 PC3
                                  PC4
                                             h2
##
                                                   112
## X1398.HK
             40 0.91 -0.01 -0.07 0.03 -0.13 0.85 0.15
## X0001.HK
              1 0.90 -0.08 -0.06 -0.20 -0.01 0.86 0.14
## X3328.HK
             47 0.89 0.01 -0.10 0.07 -0.03 0.81 0.19
                     0.05 -0.04 0.03 -0.01 0.79 0.21
## X0005.HK
              5 0.89
## X0016.HK
             10 0.88 0.01 -0.05 -0.19 -0.05 0.81 0.19
## X0939.HK
             33 0.87 0.03 -0.02 0.06 -0.09 0.78 0.22
## X0013.HK
              9 0.87 -0.10 -0.05 -0.14 0.04 0.79 0.21
## X0883.HK
             32 0.87
                      0.07 -0.04 0.18 -0.02 0.79 0.21
## X3988.HK
             48 0.86 0.05 -0.01 -0.01 -0.06 0.75 0.25
             36 0.86 0.08 0.02 0.12 0.03 0.76 0.24
## X1088.HK
## X0388.HK
             25 0.85 -0.07 -0.04 -0.18 -0.04 0.77 0.23
             43 0.85 -0.12 -0.12 -0.01 -0.11 0.76 0.24
## X2318.HK
## X2388.HK
             44 0.85 -0.03 0.06 -0.09 -0.17 0.76 0.24
             42 0.84 0.04 -0.03 0.01 -0.02 0.70 0.30
## X1898.HK
             38 0.83 -0.06 -0.15 0.17 0.07 0.76 0.24
## X1199.HK
## X0012.HK
              8 0.83 0.04 -0.06 -0.24 0.03 0.75 0.25
              4 0.83 -0.17 -0.11 -0.14 -0.04 0.75 0.25
## X0004.HK
## X0011.HK
              7 0.82 -0.01 0.09 -0.28 -0.06 0.77 0.23
## X0267.HK
             19 0.82 -0.13 0.12 -0.11 0.09 0.72 0.28
## X0144.HK
             17 0.80 -0.04 0.01 0.23 0.09 0.71 0.29
## X2600.HK
             45 0.80 -0.06 -0.14 0.04 -0.10 0.68 0.32
             27 0.80 -0.24 -0.17 0.11 -0.10 0.75 0.25
## X0688.HK
## X0857.HK
             31 0.80 0.25 -0.05 0.16
                                        0.16 0.75 0.25
## X0083.HK
             15 0.79 0.01 -0.14 -0.16 0.01 0.68 0.32
             16 0.79 -0.02 -0.18 -0.15 0.05 0.69 0.31
## X0101.HK
## X1109.HK
             37 0.79 -0.33 -0.12 0.10 -0.02 0.75 0.25
## X2628.HK
             46 0.78 0.06 -0.03 0.04 -0.04 0.62 0.38
## X0023.HK
             13 0.77 0.01 0.13 -0.11 -0.21 0.67 0.33
             28 0.75 -0.07 -0.11 0.30 -0.22 0.72 0.28
## X0700.HK
             21 0.72 -0.23 -0.02 0.02 0.05 0.57 0.43
## X0293.HK
             39 0.71 -0.01 0.05 -0.04
## X1299.HK
                                        0.04 0.51 0.49
## X0017.HK
             11 0.71 -0.10 -0.15 -0.21
                                        0.10 0.59 0.41
             26 0.68 -0.06 0.06 0.08 -0.03 0.48 0.52
## X0494.HK
## X0066.HK
             14 0.68 0.21
                            0.21 -0.23 0.09 0.61 0.39
## X1880.HK
             41 0.67 -0.14
                           0.04 0.24 -0.10 0.54 0.46
## X0762.HK
                                  0.32
             29 0.67
                      0.24 0.15
                                        0.02 0.63 0.37
                                        0.21 0.74 0.26
## X0386.HK
             24 0.67
                      0.38 -0.13 0.29
## X0291.HK
             20 0.63 -0.06 -0.07 -0.05 0.06 0.41 0.59
## X1044.HK
             35 0.60 -0.12 0.40 0.27 -0.11 0.62 0.38
## X0019.HK
             12 0.59 -0.03 0.20 -0.19 0.03 0.43 0.57
## X0941.HK
             34 0.59 0.52 0.13 0.08 0.10 0.65 0.35
## X0006.HK
              6 0.14 0.72 -0.15 0.10 -0.18 0.60 0.40
## X0002.HK
              2 0.37
                      0.71 0.06 -0.10 -0.12 0.67 0.33
## X0003.HK
              3 0.42 0.54
                            0.21 -0.29 0.19 0.63 0.37
## X0322.HK
             22 0.40 -0.17
                            0.65 -0.09 -0.15 0.65 0.35
## X0151.HK
             18 0.53 -0.16
                            0.57
                                  0.19
                                        0.05 0.67 0.33
## X0836.HK
             30 0.40 -0.12 0.09
                                  0.07
                                        0.66 0.63 0.37
## X0330.HK
             23 0.46 -0.13 -0.06 0.01 0.50 0.48 0.52
##
##
                   PC1 PC2 PC3 PC4 PC5
## SS loadings
                 26.68 2.36 1.42 1.26 1.15
```

```
## Proportion Var 0.56 0.05 0.03 0.03 0.02
## Cumulative Var 0.56 0.61 0.63 0.66 0.68
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are 1128 and the objective function was 52.96 0.3
## The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## 0.3
## Fit based upon off diagonal values = 1
##
              PC1
                         PC2
## X0001.HK 0.9020 -0.079983
## X0002.HK 0.3708 0.707782
## X0003.HK 0.4180 0.543605
## X0004.HK 0.8283 -0.165931
## X0005.HK 0.8883 0.046398
## X0006.HK 0.1352
                   0.716064
## X0011.HK 0.8245 -0.014239
## X0012.HK 0.8312 0.039742
## X0013.HK 0.8706 -0.097175
## X0016.HK 0.8790 0.012336
## X0017.HK 0.7105 -0.104107
## X0019.HK 0.5906 -0.032438
## X0023.HK 0.7747 0.010179
## X0066.HK 0.6820
                   0.207671
## X0083.HK 0.7949 0.005761
## X0101.HK 0.7945 -0.021440
## X0144.HK 0.8019 -0.044185
## X0151.HK 0.5286 -0.159940
## X0267.HK 0.8177 -0.134563
## X0291.HK 0.6264 -0.061590
## X0293.HK 0.7164 -0.234757
## X0322.HK 0.4048 -0.172635
## X0330.HK 0.4561 -0.131034
## X0386.HK 0.6690 0.378176
## X0388.HK 0.8543 -0.072638
## X0494.HK 0.6828 -0.057281
## X0688.HK 0.7985 -0.236553
## X0700.HK 0.7514 -0.070504
## X0762.HK 0.6748 0.235874
## X0836.HK 0.4010 -0.122658
## X0857.HK 0.7967 0.250921
## X0883.HK 0.8659 0.068491
## X0939.HK 0.8739 0.033092
## X0941.HK 0.5895 0.521015
## X1044.HK 0.6005 -0.122358
## X1088.HK 0.8609 0.083242
## X1109.HK 0.7854 -0.325462
## X1199.HK 0.8339 -0.057864
## X1299.HK 0.7123 -0.013317
## X1398.HK 0.9079 -0.012519
## X1880.HK 0.6748 -0.142850
## X1898.HK 0.8363 0.041317
## X2318.HK 0.8515 -0.115034
## X2388.HK 0.8502 -0.028278
## X2600.HK 0.8004 -0.061495
```



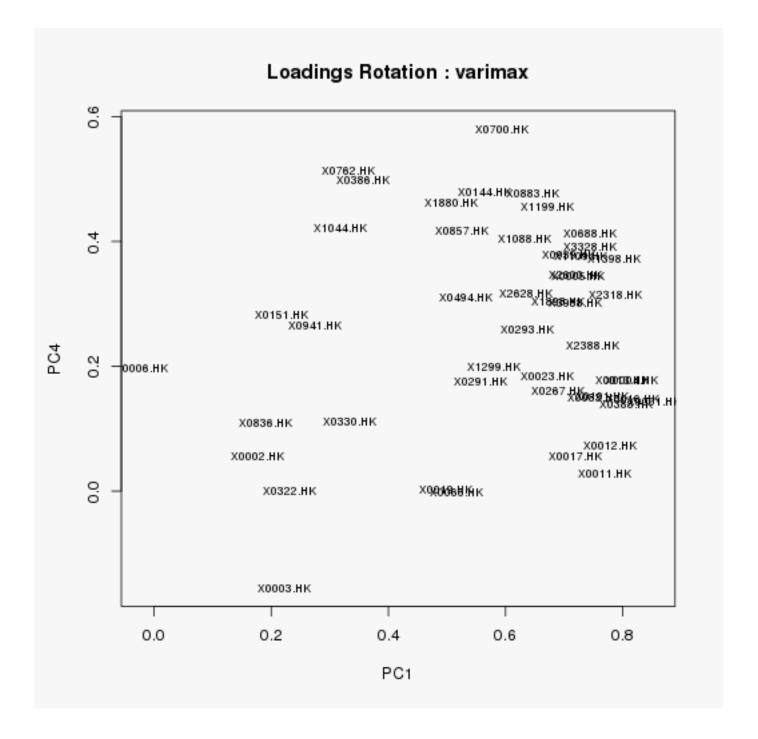
PC1

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
##
                           PC4
                                        PC3
             item
                    PC1
                                  PC2
                                              PC5
                                                     h2
                                                           u2
##
                   0.85
                                       0.21
   X0001.HK
                1
                          0.14
                                0.19
                                              0.18 0.86 0.14
##
   X0016.HK
               10
                   0.82
                          0.15
                                0.27
                                       0.19
                                             0.13 0.81 0.19
##
   X0004.HK
                4
                   0.81
                          0.18
                                0.07
                                       0.16
                                             0.14 0.75 0.25
                   0.81
##
  X0388.HK
               25
                          0.14
                                0.18
                                       0.22
                                             0.15 0.77 0.23
  X0013.HK
                   0.80
                                0.16
                                       0.21
##
                9
                          0.18
                                             0.23 0.79 0.21
  X2318.HK
               43
                   0.79
                          0.31
                                0.11
                                       0.16
                                              0.09 0.76 0.24
##
##
  X1398.HK
               40
                   0.78
                          0.37
                                0.22
                                       0.20
                                             0.07 0.85 0.15
##
  X0012.HK
                   0.78
                          0.07
                                0.29
                                       0.16
                                             0.19 0.75 0.25
                8
                7
                   0.77
                                0.25
                                       0.33
##
   X0011.HK
                          0.03
                                             0.11 0.77 0.23
   X0101.HK
                   0.76
                          0.15
                                0.20
                                       0.04
                                              0.21 0.69 0.31
##
               16
##
   X0083.HK
               15
                   0.75
                          0.15
                                0.23
                                       0.09
                                              0.17 0.68 0.32
##
   X2388.HK
                   0.75
                          0.23
                                0.22
                                       0.31
                                              0.02 0.76 0.24
               44
##
   X3328.HK
               47
                   0.74
                          0.39
                                0.24
                                       0.15
                                             0.16 0.81 0.19
   X0688.HK
                   0.74
                          0.41
                               -0.04
               27
                                       0.11
                                              0.10 0.75 0.25
##
  X1109.HK
               37
                   0.73
                          0.38
                               -0.12
                                       0.17
                                              0.18 0.75 0.25
   X0005.HK
                   0.72
                          0.35
                                0.28
                                       0.20
                                             0.18 0.79 0.21
##
                5
##
   X2600.HK
               45
                   0.72
                          0.35
                                0.14
                                       0.11
                                              0.08 0.68 0.32
   X3988.HK
               48
                   0.72
                          0.30
                                0.28
                                       0.22
                                              0.13 0.75 0.25
   X0017.HK
                          0.06
                                0.11
                                       0.06
                                              0.24 0.59 0.41
##
                   0.72
               11
                                0.26
                                       0.23
##
  X0939.HK
                   0.71
                          0.38
                                              0.11 0.78 0.22
               33
## X0267.HK
               19
                   0.69
                          0.16
                                0.13
                                       0.35
                                             0.28 0.72 0.28
## X1898.HK
               42
                   0.69
                          0.30
                                0.27
                                       0.19
                                             0.16 0.70 0.30
                                       0.09
## X1199.HK
               38
                   0.67
                          0.46
                                0.14
                                             0.26 0.76 0.24
  X0023.HK
                   0.67
                                0.24
                                       0.36
##
               13
                          0.18
                                            -0.03 0.67 0.33
##
   X0883.HK
               32
                   0.65
                          0.48
                                0.28
                                       0.19
                                              0.17 0.79 0.21
                               -0.03
                                       0.21
##
   X0293.HK
               21
                   0.64
                          0.26
                                              0.23 0.57 0.43
   X2628.HK
                   0.63
                          0.32
                                0.26
                                       0.18
##
               46
                                             0.13 0.62 0.38
                                0.31
##
   X1088.HK
               36
                   0.63
                          0.40
                                       0.24
                                             0.22 0.76 0.24
   X0700.HK
               28
                   0.59
                          0.58
                                0.09
                                       0.15
                                            -0.03 0.72 0.28
##
##
   X1299.HK
               39
                   0.58
                          0.20
                                0.20
                                       0.24
                                             0.20 0.51 0.49
   X0144.HK
                   0.56
                          0.48
                                       0.23
                                             0.29 0.71 0.29
##
               17
                                0.16
##
   X0291.HK
               20
                   0.56
                          0.18
                                0.11
                                       0.11
                                              0.20 0.41 0.59
   X0494.HK
                          0.31
                                       0.26
               26
                   0.53
                                0.13
                                              0.14 0.48 0.52
##
   X0857.HK
               31
                   0.52
                          0.42
                                0.44
                                       0.10
                                              0.31 0.75 0.25
## X0066.HK
                   0.52
                          0.00
                                0.43
                                       0.34
                                             0.21 0.61 0.39
               14
## X1880.HK
                   0.51
                          0.46
                                0.03
                                       0.26
               41
                                             0.08 0.54 0.46
  X0019.HK
                   0.50
                          0.00
                                0.18
                                       0.36
                                              0.16 0.43 0.57
##
  X0762.HK
               29
                   0.33
                          0.51
                                0.39
                                       0.28
                                             0.17 0.63 0.37
## X0002.HK
                2
                   0.18
                          0.06
                                0.79
                                       0.04
                                            -0.11 0.67 0.33
##
   X0003.HK
                3
                   0.22
                         -0.16
                                0.69
                                       0.18
                                             0.22 0.63 0.37
   X0006.HK
                          0.20
##
                6
                  -0.02
                                0.68
                                      -0.21
                                            -0.22 0.60 0.40
  X0941.HK
                   0.27
                          0.27
                                0.67
                                       0.17
                                             0.18 0.65 0.35
##
               34
## X0386.HK
               24
                   0.36
                          0.50
                                0.51
                                      -0.04
                                             0.33 0.74 0.26
## X0322.HK
               22
                   0.23
                          0.00
                                0.02
                                       0.77 -0.02 0.65 0.35
## X0151.HK
               18
                   0.22
                          0.28
                                0.04
                                       0.70
                                             0.22 0.67 0.33
## X1044.HK
                   0.32
                                0.06
                                       0.58
                                             0.07 0.62 0.38
               35
                          0.42
```

```
## X0836.HK
             30 0.19 0.11 0.02 0.13 0.75 0.63 0.37
## X0330.HK
             23  0.33  0.11  0.01  0.03  0.59  0.48  0.52
##
##
                   PC1 PC4 PC2 PC3 PC5
## SS loadings
                 18.57 4.38 4.19 3.35 2.38
## Proportion Var 0.39 0.09 0.09 0.07 0.05
## Cumulative Var 0.39 0.48 0.57 0.64 0.68
##
## Test of the hypothesis that 5 components are sufficient.
##
## The degrees of freedom for the null model are 1128 and the objective function was 52.96 0.3
## The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## Fit based upon off diagonal values = 1
##
                PC1
                           PC4
                    0.1434488
## X0001.HK 0.85445
## X0002.HK 0.17684 0.0553663
## X0003.HK 0.22309 -0.1554423
## X0004.HK 0.81457 0.1776878
## X0005.HK 0.72277 0.3451309
## X0006.HK -0.02091 0.1958786
## X0011.HK 0.76812 0.0289371
## X0012.HK 0.77785 0.0735117
## X0013.HK 0.79919 0.1785733
## X0016.HK 0.81712 0.1475954
## X0017.HK 0.71801 0.0550422
## X0019.HK 0.49747 0.0033476
## X0023.HK 0.67034 0.1847905
## X0066.HK 0.51649 -0.0023403
## X0083.HK 0.75204 0.1494415
## X0101.HK 0.76474
                    0.1519732
## X0144.HK 0.56426
                     0.4784855
## X0151.HK 0.21842 0.2826592
## X0267.HK 0.69052 0.1605244
## X0291.HK 0.55778 0.1759340
## X0293.HK
            0.63656
                     0.2590670
## X0322.HK
            0.23152 0.0004501
## X0330.HK
            0.33329
                     0.1119339
## X0386.HK
            0.35641
                    0.4991103
## X0388.HK 0.80663 0.1399490
## X0494.HK 0.53286 0.3094014
## X0688.HK 0.74348 0.4132935
## X0700.HK 0.59371 0.5800790
## X0762.HK 0.33183 0.5137571
## X0836.HK 0.19036 0.1096550
## X0857.HK 0.52479
                     0.4176641
## X0883.HK 0.64503 0.4760777
## X0939.HK 0.70770 0.3785850
## X0941.HK 0.27422 0.2654064
## X1044.HK 0.31672 0.4212532
## X1088.HK
            0.63295
                     0.4044019
## X1109.HK
            0.72784
                     0.3773348
## X1199.HK
            0.67173
                     0.4563448
## X1299.HK
            0.58072 0.1985599
## X1398.HK 0.78475 0.3720119
```



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
              40 0.91 -0.01 -0.07
                                    0.03 -0.13 0.85 0.15
## X1398.HK
## X0001.HK
               1 0.90 -0.08 -0.06 -0.20 -0.01 0.86 0.14
                                    0.07 -0.03 0.81 0.19
  X3328.HK
              47 0.89
                       0.01 -0.10
##
##
  X0005.HK
               5 0.89
                       0.05 -0.04
                                    0.03 -0.01 0.79 0.21
## X0016.HK
              10 0.88
                       0.01 -0.05 -0.19 -0.05 0.81 0.19
## X0939.HK
                       0.03 -0.02
                                    0.06 -0.09 0.78 0.22
              33 0.87
## X0013.HK
               9 0.87 -0.10 -0.05 -0.14 0.04 0.79 0.21
## X0883.HK
              32 0.87
                       0.07 - 0.04
                                    0.18 -0.02 0.79 0.21
## X3988.HK
              48 0.86
                       0.05 -0.01 -0.01 -0.06 0.75 0.25
## X1088.HK
              36 0.86
                       0.08
                             0.02
                                    0.12
                                          0.03 0.76 0.24
              25 0.85 -0.07 -0.04 -0.18 -0.04 0.77 0.23
## X0388.HK
## X2318.HK
              43 0.85 -0.12 -0.12 -0.01 -0.11 0.76 0.24
## X2388.HK
              44 0.85 -0.03
                              0.06 -0.09 -0.17 0.76 0.24
## X1898.HK
              42 0.84
                       0.04 -0.03
                                    0.01 -0.02 0.70 0.30
## X1199.HK
              38 0.83 -0.06 -0.15
                                    0.17
                                          0.07 0.76 0.24
## X0012.HK
               8 0.83
                       0.04 -0.06 -0.24
                                          0.03 0.75 0.25
## X0004.HK
               4 0.83 -0.17 -0.11 -0.14 -0.04 0.75 0.25
               7 0.82 -0.01
## X0011.HK
                              0.09 -0.28 -0.06 0.77 0.23
## X0267.HK
              19 0.82 -0.13
                              0.12 - 0.11
                                          0.09 0.72 0.28
## X0144.HK
              17 0.80 -0.04
                              0.01
                                    0.23
                                          0.09 0.71 0.29
## X2600.HK
              45 0.80 -0.06 -0.14
                                    0.04 -0.10 0.68 0.32
## X0688.HK
              27 0.80 -0.24 -0.17
                                    0.11 -0.10 0.75 0.25
## X0857.HK
              31 0.80
                       0.25 - 0.05
                                    0.16
                                          0.16 0.75 0.25
## X0083.HK
              15 0.79
                       0.01 -0.14 -0.16
                                          0.01 0.68 0.32
## X0101.HK
              16 0.79 -0.02 -0.18 -0.15
                                          0.05 0.69 0.31
## X1109.HK
              37 0.79 -0.33 -0.12
                                    0.10 -0.02 0.75 0.25
## X2628.HK
              46 0.78
                       0.06 -0.03
                                    0.04 -0.04 0.62 0.38
## X0023.HK
                             0.13 -0.11 -0.21 0.67 0.33
              13 0.77
                       0.01
## X0700.HK
              28 0.75 -0.07 -0.11
                                    0.30 -0.22 0.72 0.28
              21 0.72 -0.23 -0.02
## X0293.HK
                                    0.02
                                          0.05 0.57 0.43
## X1299.HK
              39 0.71 -0.01
                              0.05 - 0.04
                                          0.04 0.51 0.49
## X0017.HK
              11 0.71 -0.10 -0.15 -0.21
                                          0.10 0.59 0.41
## X0494.HK
              26 0.68 -0.06
                              0.06
                                    0.08 -0.03 0.48 0.52
##
  X0066.HK
              14 0.68
                       0.21
                              0.21
                                   -0.23
                                          0.09 0.61 0.39
  X1880.HK
              41 0.67 -0.14
                              0.04
                                    0.24
                                         -0.10 0.54 0.46
## X0762.HK
              29 0.67
                       0.24
                              0.15
                                    0.32
                                          0.02 0.63 0.37
## X0386.HK
              24 0.67
                       0.38 -0.13
                                    0.29
                                          0.21 0.74 0.26
## X0291.HK
              20 0.63 -0.06 -0.07 -0.05
                                          0.06 0.41 0.59
## X1044.HK
              35 0.60 -0.12
                             0.40
                                    0.27 -0.11 0.62 0.38
## X0019.HK
              12 0.59 -0.03
                              0.20 - 0.19
                                          0.03 0.43 0.57
              34 0.59
## X0941.HK
                       0.52
                              0.13
                                    0.08
                                          0.10 0.65 0.35
## X0006.HK
               6 0.14
                       0.72 - 0.15
                                    0.10 -0.18 0.60 0.40
## X0002.HK
                              0.06 -0.10 -0.12 0.67 0.33
               2 0.37
                       0.71
## X0003.HK
               3 0.42
                       0.54
                              0.21 - 0.29
                                          0.19 0.63 0.37
## X0322.HK
              22 0.40 -0.17
                              0.65 -0.09 -0.15 0.65 0.35
## X0151.HK
              18 0.53 -0.16
                              0.57
                                    0.19
                                          0.05 0.67 0.33
## X0836.HK
              30 0.40 -0.12
                              0.09
                                    0.07
                                          0.66 0.63 0.37
## X0330.HK
              23 0.46 -0.13 -0.06
                                    0.01
                                          0.50 0.48 0.52
```

```
##
##
                   PC1 PC2 PC3 PC4 PC5
## SS loadings
                 26.68 2.36 1.42 1.26 1.15
## Proportion Var 0.56 0.05 0.03 0.03 0.02
## Cumulative Var 0.56 0.61 0.63 0.66 0.68
## Test of the hypothesis that 5 components are sufficient.
##
\#\# The degrees of freedom for the null model are 1128 and the objective function was 52.96 0.3
\#\# The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## Fit based upon off diagonal values = 1
               PC1
## X0001.HK 0.9020 -0.079983
## X0002.HK 0.3708 0.707782
                   0.543605
## X0003.HK 0.4180
## X0004.HK 0.8283 -0.165931
## X0005.HK 0.8883 0.046398
## X0006.HK 0.1352 0.716064
## X0011.HK 0.8245 -0.014239
## X0012.HK 0.8312 0.039742
## X0013.HK 0.8706 -0.097175
## X0016.HK 0.8790 0.012336
## X0017.HK 0.7105 -0.104107
## X0019.HK 0.5906 -0.032438
## X0023.HK 0.7747 0.010179
## X0066.HK 0.6820 0.207671
## X0083.HK 0.7949 0.005761
## X0101.HK 0.7945 -0.021440
## X0144.HK 0.8019 -0.044185
## X0151.HK 0.5286 -0.159940
## X0267.HK 0.8177 -0.134563
## X0291.HK 0.6264 -0.061590
## X0293.HK 0.7164 -0.234757
## X0322.HK 0.4048 -0.172635
## X0330.HK 0.4561 -0.131034
## X0386.HK 0.6690 0.378176
## X0388.HK 0.8543 -0.072638
## X0494.HK 0.6828 -0.057281
## X0688.HK 0.7985 -0.236553
## X0700.HK 0.7514 -0.070504
## X0762.HK 0.6748 0.235874
## X0836.HK 0.4010 -0.122658
## X0857.HK 0.7967 0.250921
## X0883.HK 0.8659 0.068491
## X0939.HK 0.8739 0.033092
## X0941.HK 0.5895 0.521015
## X1044.HK 0.6005 -0.122358
## X1088.HK 0.8609 0.083242
## X1109.HK 0.7854 -0.325462
## X1199.HK 0.8339 -0.057864
## X1299.HK 0.7123 -0.013317
## X1398.HK 0.9079 -0.012519
## X1880.HK 0.6748 -0.142850
## X1898.HK 0.8363 0.041317
```

```
## X2318.HK 0.8515 -0.115034

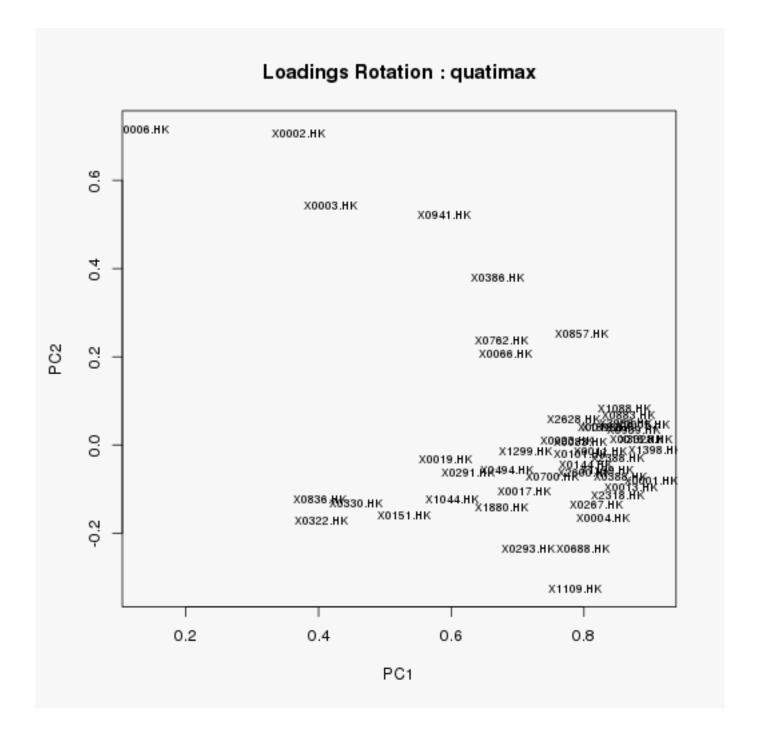
## X2388.HK 0.8502 -0.028278

## X2600.HK 0.8004 -0.061495

## X2628.HK 0.7841 0.059278

## X3328.HK 0.8934 0.014184

## X3988.HK 0.8632 0.048794
```



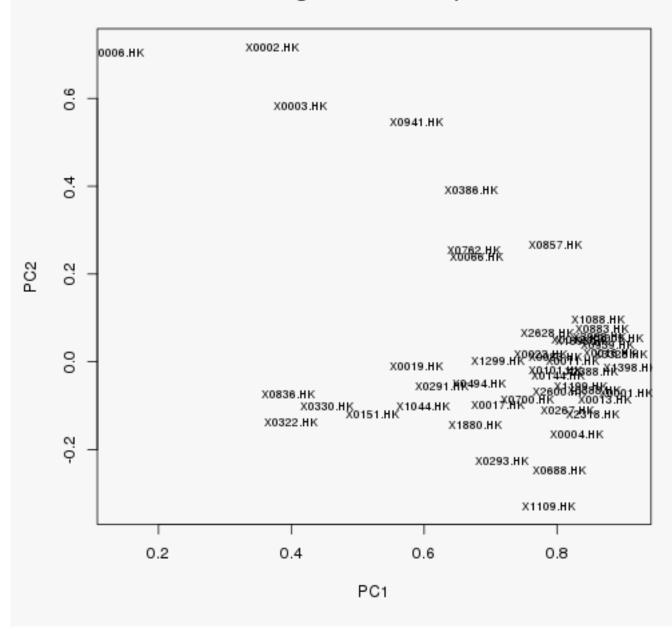
5.2.4 Rotation: simplimax

A compromise between Varimax and Quartimax criteria.

```
## Warning message: convergence not obtained in GPFoblq. 1000 iterations used.
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "simplimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##
            item PC1
                        PC2
                              PC3
                                    PC4
                                           PC5
                                                 h2
                                                      u2
## X1398.HK
              40 0.91 -0.01 -0.06
                                   0.01 -0.10 0.85 0.15
## X0001.HK
               1 0.90 -0.07 -0.01
                                   0.23
                                          0.04 0.86 0.14
## X3328.HK
              47 0.90
                       0.02 -0.08 -0.03 -0.01 0.81 0.19
## X0005.HK
               5 0.89
                       0.05 -0.01
                                   0.00
                                          0.02 0.79 0.21
## X0016.HK
              10 0.88
                       0.02
                             0.00
                                   0.22
                                          0.00 0.81 0.19
## X0939.HK
              33 0.88
                       0.04
                             0.00 -0.04 -0.06 0.78 0.22
## X0013.HK
               9 0.87 -0.09
                             0.00
                                   0.16
                                          0.09 0.79 0.21
## X0883.HK
              32 0.87
                       0.07 -0.02 -0.15 -0.01 0.79 0.21
## X3988.HK
              48 0.86
                       0.06
                             0.02 0.04 -0.03 0.75 0.25
                             0.05 -0.10
## X1088.HK
              36 0.86
                       0.10
                                          0.05 0.76 0.24
## X0388.HK
                             0.01
                                   0.21
              25 0.86 -0.07
                                          0.02 0.77 0.23
## X2318.HK
              43 0.85 -0.12 -0.11
                                   0.05 -0.07 0.76 0.24
## X2388.HK
              44 0.85 -0.02
                             0.08
                                   0.10 -0.13 0.76 0.24
## X1898.HK
              42 0.84
                       0.05
                             0.00
                                   0.02
                                          0.01 0.70 0.30
## X1199.HK
              38 0.84 -0.06 -0.14 -0.12
                                          0.09 0.76 0.24
## X0012.HK
               8 0.83
                       0.05
                             0.01
                                   0.27
                                          0.09 0.75 0.25
## X0004.HK
               4 0.83 -0.17 -0.08
                                          0.01 0.75 0.25
                                   0.18
## X0011.HK
               7 0.82
                      0.00
                             0.15
                                   0.29 -0.01 0.77 0.23
              19 0.82 -0.11
## X0267.HK
                             0.17
                                   0.11
                                          0.13 0.72 0.28
              45 0.80 -0.07 -0.13
                                   0.00 -0.07 0.68 0.32
## X2600.HK
              27 0.80 -0.25 -0.19 -0.07 -0.08 0.75 0.25
## X0688.HK
## X0144.HK
              17 0.80 -0.03
                             0.02 - 0.21
                                          0.10 0.71 0.29
## X0857.HK
              31 0.80
                       0.27
                             0.00 - 0.13
                                          0.17 0.75 0.25
## X0083.HK
                       0.01 -0.09
                                   0.20
                                          0.06 0.68 0.32
              15 0.80
## X0101.HK
              16 0.80 -0.02 -0.13 0.20
                                          0.10 0.69 0.31
## X1109.HK
              37 0.79 -0.33 -0.13 -0.06
                                         0.00 0.75 0.25
## X2628.HK
              46 0.79
                       0.06 -0.01 -0.01 -0.01 0.62 0.38
                                   0.11 -0.17 0.67 0.33
## X0023.HK
              13 0.78
                       0.02
                             0.15
              28 0.76 -0.09 -0.15 -0.26 -0.22 0.72 0.28
## X0700.HK
## X0293.HK
              21 0.72 -0.23 -0.01
                                   0.00
                                          0.08 0.57 0.43
## X1299.HK
              39 0.71
                       0.00
                             0.09
                                   0.05
                                          0.08 0.51 0.49
## X0017.HK
              11 0.71 -0.10 -0.09
                                   0.25
                                          0.15 0.59 0.41
## X0494.HK
              26 0.68 -0.05
                             0.06 -0.07 -0.01 0.48 0.52
## X0066.HK
              14 0.68
                       0.24
                             0.29
                                   0.21
                                          0.13 0.61 0.39
## X1880.HK
              41 0.68 -0.14
                             0.01 -0.23 -0.10 0.54 0.46
## X0762.HK
              29 0.67
                       0.25
                             0.15 - 0.32
                                          0.01 0.63 0.37
## X0386.HK
              24 0.67
                       0.39
                            -0.09 -0.25
                                          0.20 0.74 0.26
                                   0.07
## X0291.HK
              20 0.63 -0.05 -0.04
                                          0.09 0.41 0.59
## X1044.HK
              35 0.60 -0.10
                             0.37 -0.31 -0.11 0.62 0.38
## X0019.HK
              12 0.59 -0.01
                             0.25
                                   0.17
                                          0.07 0.43 0.57
## X0941.HK
              34 0.59
                       0.55
                             0.20 -0.08
                                          0.10 0.65 0.35
## X0002.HK
               2 0.37
                       0.72
                             0.14
                                   0.11 -0.11 0.67 0.33
## X0006.HK
               6 0.14
                       0.70 -0.11 -0.06 -0.20 0.60 0.40
## X0003.HK
               3 0.41
                       0.58
                             0.33
                                   0.27
                                          0.23 0.63 0.37
## X0322.HK
              22 0.40 -0.14
                             0.65
                                   0.00 -0.13 0.65 0.35
## X0151.HK
              18 0.52 -0.12
                             0.55 - 0.26
                                          0.05 0.67 0.33
                             0.16 -0.09
## X0836.HK
              30 0.39 -0.07
                                          0.68 0.63 0.37
## X0330.HK
              23 0.45 -0.10 0.00 0.00 0.52 0.48 0.52
```

```
##
##
                   PC1 PC2 PC3 PC4 PC5
## SS loadings
                 26.66 2.37 1.43 1.26 1.16
## Proportion Var 0.56 0.05 0.03 0.03 0.02
## Cumulative Var 0.56 0.60 0.63 0.66 0.68
##
##
   With component correlations of
##
        PC1
             PC2
                   PC3
                         PC4
## PC1 1.00 -0.01 -0.02 -0.02 -0.02
## PC2 -0.01 1.00 -0.16 -0.01 -0.03
## PC3 -0.02 -0.16 1.00 0.04 -0.11
## PC4 -0.02 -0.01 0.04 1.00 -0.09
## PC5 -0.02 -0.03 -0.11 -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 52.96 0.3
## The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## Fit based upon off diagonal values = 1
              PC1
## X0001.HK 0.9030 -0.0717956
## X0002.HK 0.3710 0.7168682
## X0003.HK 0.4133
                   0.5817589
## X0004.HK 0.8304 -0.1650708
## X0005.HK 0.8896 0.0544112
## X0006.HK 0.1388 0.7033598
## X0011.HK 0.8239 0.0008487
## X0012.HK 0.8317 0.0512471
## X0013.HK 0.8713 -0.0865020
## X0016.HK 0.8803 0.0188634
## X0017.HK 0.7114 -0.0970446
## X0019.HK 0.5879 -0.0091575
## X0023.HK 0.7753 0.0165013
## X0066.HK 0.6786
                  0.2388536
## X0083.HK 0.7967 0.0096027
## X0101.HK 0.7965 -0.0184202
## X0144.HK 0.8021 -0.0309078
## X0151.HK 0.5223 -0.1191193
## X0267.HK 0.8158 -0.1114738
## X0291.HK 0.6270 -0.0544183
## X0293.HK 0.7169 -0.2265605
## X0322.HK 0.3984 -0.1373159
## X0330.HK 0.4529 -0.1001845
## X0386.HK 0.6700 0.3911800
## X0388.HK 0.8554 -0.0653314
## X0494.HK 0.6832 -0.0485786
## X0688.HK 0.8025 -0.2473606
## X0700.HK 0.7559 -0.0852337
## X0762.HK 0.6742 0.2530187
## X0836.HK 0.3947 -0.0742719
## X0857.HK 0.7969 0.2676382
## X0883.HK 0.8677
                   0.0741691
## X0939.HK 0.8757
                   0.0371540
## X0941.HK 0.5877 0.5458869
```

Loadings Rotation: simplimax



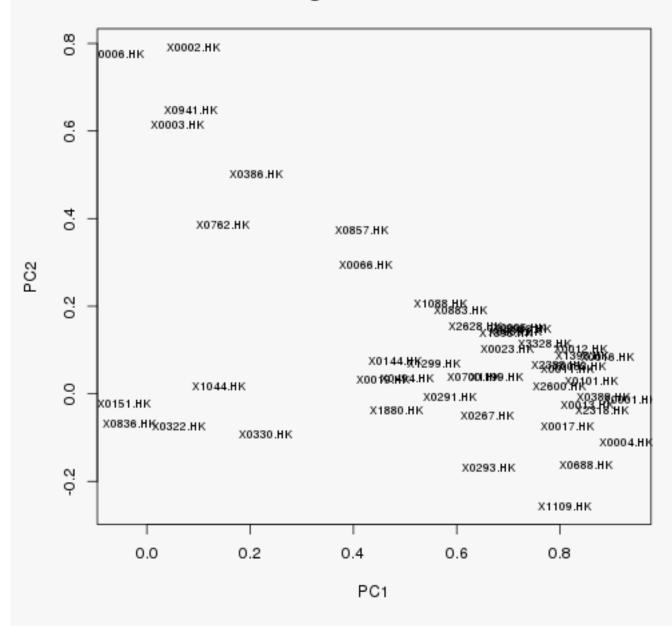
5.2.5 Rotation: oblimin

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

```
## Principal Components Analysis
   Call: principal(r = dxtaRetok, nfactors = 5, rotate = "oblimin")
##
   Standardized loadings (pattern matrix) based upon correlation matrix
##
            item
                    PC1
                          PC2
                                PC3
                                      PC5
                                             PC4
                                                   h2
                                                        u2
                               0.00
                                     0.02 -0.12 0.86 0.14
## X0001.HK
                1
                  0.94 - 0.01
## X0004.HK
                  0.93 -0.11 -0.03
                                     0.00 -0.04 0.75 0.25
                4
  X0016.HK
                        0.09
                               0.00 -0.02 -0.11 0.81 0.19
##
              10
                  0.89
##
   X0388.HK
              25
                  0.88 -0.01
                               0.02
                                     0.00 -0.11 0.77 0.23
##
  X2318.HK
              43
                  0.88 -0.04
                               0.00 -0.04
                                           0.09 0.76 0.24
                        0.03 -0.16
                                     0.09 -0.07 0.69 0.31
## X0101.HK
              16
                  0.86
## X0013.HK
                  0.85 -0.03
                              0.02
                                     0.09 -0.08 0.79 0.21
               9
## X0688.HK
              27
                  0.85 -0.16 -0.01 -0.01
                                           0.23 0.75 0.25
## X1398.HK
              40
                  0.84
                         0.09
                              0.06 -0.05
                                           0.12 0.85 0.15
## X0012.HK
                  0.84
                         0.10 -0.04
                                     0.05 -0.18 0.75 0.25
               8
                                     0.04 -0.08 0.68 0.32
## X0083.HK
              15
                  0.84
                         0.06 - 0.11
  X0017.HK
                   0.81 -0.07 -0.14
                                     0.12 -0.15 0.59 0.41
##
              11
##
  X0011.HK
               7
                   0.81
                        0.06
                               0.14 -0.06 -0.24 0.77 0.23
## X1109.HK
              37
                  0.81 -0.26
                              0.04
                                     0.08
                                           0.19 0.75 0.25
## X2600.HK
              45
                  0.80
                        0.02 -0.02 -0.03
                                            0.14 0.68 0.32
## X2388.HK
                  0.80
                         0.06
                               0.17 -0.12 -0.02 0.76 0.24
              44
  X3328.HK
                  0.77
                         0.12
                               0.02
                                     0.06
                                            0.14 0.81 0.19
##
              47
## X3988.HK
              48
                  0.73
                               0.09
                                     0.01
                                            0.04 0.75 0.25
                         0.15
##
  X0005.HK
               5
                  0.72
                         0.15
                               0.07
                                     0.08
                                           0.08 0.79 0.21
##
  X0939.HK
              33
                   0.71
                         0.14
                               0.12
                                     0.00
                                            0.13 0.78 0.22
## X0023.HK
                  0.70
                         0.10
                               0.24 -0.17 -0.05 0.67 0.33
              13
## X1898.HK
                  0.69
                               0.07
                                     0.06
                                           0.06 0.70 0.30
                         0.14
              42
## X1199.HK
              38
                  0.68
                         0.04 - 0.02
                                     0.19
                                            0.23 0.76 0.24
## X0293.HK
              21
                  0.66 -0.17
                               0.09
                                     0.14
                                            0.06 0.57 0.43
## X0267.HK
              19
                  0.66 -0.05
                               0.21
                                     0.16 -0.11 0.72 0.28
## X2628.HK
                  0.63
                         0.16
                               0.07
                                     0.04
                                            0.09 0.62 0.38
              46
## X0700.HK
              28
                  0.63
                         0.04
                               0.11 - 0.10
                                            0.41 0.72 0.28
## X0883.HK
                               0.11
              32
                  0.61
                         0.19
                                     0.10
                                            0.22 0.79 0.21
## X0291.HK
                  0.59 -0.01 -0.01
                                     0.11 -0.01 0.41 0.59
              20
## X1088.HK
              36
                  0.57
                         0.21
                               0.15
                                     0.15
                                           0.14 0.76 0.24
## X1299.HK
              39
                  0.55
                         0.07
                               0.13
                                     0.11 -0.03 0.51 0.49
## X0494.HK
              26
                  0.50
                         0.03
                               0.19
                                     0.06
                                            0.11 0.48 0.52
  X1880.HK
                   0.48 - 0.04
                               0.23
                                     0.02
                                            0.28 0.54 0.46
##
              41
##
   X0144.HK
              17
                   0.48
                         0.08
                               0.18
                                     0.24
                                            0.24 0.71 0.29
   X0019.HK
                   0.46
                         0.03
                               0.24
                                     0.05 -0.21 0.43 0.57
              12
##
  X0066.HK
              14
                  0.42
                         0.29
                               0.21
                                     0.11 -0.27 0.61 0.39
## X0857.HK
                  0.42
                         0.37
                               0.03
                                     0.29
                                           0.16 0.75 0.25
              31
## X0002.HK
                  0.09
                         0.79
                               0.01 -0.13 -0.11 0.67 0.33
               2
## X0006.HK
                6 -0.06
                         0.78 -0.19 -0.18
                                           0.14 0.60 0.40
## X0941.HK
                  0.09
                         0.65
                               0.16
                                     0.18
                                           0.02 0.65 0.35
              34
## X0003.HK
               3
                  0.06
                         0.61
                               0.10
                                     0.19 -0.38 0.63 0.37
## X0386.HK
              24
                  0.21
                         0.50
                              -0.06
                                     0.36
                                            0.28 0.74 0.26
## X0762.HK
                         0.39
                               0.31
              29
                  0.15
                                     0.17
                                            0.28 0.63 0.37
## X0322.HK
                  0.06 -0.08
                               0.80
                                    -0.11 -0.19 0.65 0.35
              22
## X0151.HK
              18 -0.04 -0.02
                               0.77
                                     0.19
                                           0.06 0.67 0.33
## X1044.HK
              35
                  0.14
                        0.02
                               0.64
                                     0.04
                                           0.21 0.62 0.38
## X0836.HK
              30 -0.03 -0.07
                               0.09
                                     0.79 -0.07 0.63 0.37
## X0330.HK
              23 0.23 -0.09 -0.06 0.60 -0.05 0.48 0.52
```

```
##
##
                   PC1 PC2 PC3 PC5 PC4
## SS loadings
                 21.78 3.69 3.34 2.49 1.57
## Proportion Var 0.45 0.08 0.07 0.05 0.03
## Cumulative Var 0.45 0.53 0.60 0.65 0.68
##
   With component correlations of
       PC1 PC2 PC3 PC5 PC4
##
## PC1 1.00 0.39 0.53 0.47 0.20
## PC2 0.39 1.00 0.18 0.16 0.05
## PC3 0.53 0.18 1.00 0.25 0.08
## PC5 0.47 0.16 0.25 1.00 0.10
## PC4 0.20 0.05 0.08 0.10 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 52.96 0.3
## The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## 0.3
## Fit based upon off diagonal values = 1
                PC1
## X0001.HK 0.93664 -0.011951
## X0002.HK 0.08998 0.791633
## X0003.HK
            0.05900 0.613550
## X0004.HK 0.92734 -0.110655
## X0005.HK 0.72122 0.151912
## X0006.HK -0.05623 0.776690
## X0011.HK 0.81364 0.055544
## X0012.HK 0.83960 0.101194
## X0013.HK 0.85195 -0.025840
## X0016.HK
            0.89247
                    0.085046
## X0017.HK
            0.81379 -0.072749
## X0019.HK
            0.45633 0.031906
## X0023.HK 0.69686 0.102525
## X0066.HK
            0.42318
                    0.294283
## X0083.HK
            0.83608
                     0.062855
## X0101.HK
            0.86017
                     0.028900
## X0144.HK 0.47966
                     0.076143
## X0151.HK -0.04466 -0.022807
## X0267.HK 0.65840 -0.048939
## X0291.HK 0.58526 -0.006741
## X0293.HK 0.66137 -0.167660
## X0322.HK 0.06175 -0.075558
## X0330.HK 0.22991 -0.093919
## X0386.HK 0.21194 0.502003
## X0388.HK 0.88361 -0.005768
## X0494.HK
            0.50457 0.034744
## X0688.HK 0.85133 -0.164038
## X0700.HK 0.63434 0.039469
## X0762.HK 0.14753 0.386054
## X0836.HK -0.03340 -0.068383
## X0857.HK
            0.41502
                    0.373587
## X0883.HK
            0.60668
                     0.191956
## X0939.HK 0.71323
                     0.143239
## X0941.HK 0.08504 0.647791
```

Loadings Rotation : oblimin



5.2.6 Rotation: promax

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

```
## Principal Components Analysis
## Call: principal(r = dxtaRetok, nfactors = 5, rotate = "promax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##
            item
                   PC1
                          PC4
                                PC2
                                      PC3
                                            PC5
                                                   h2
                                                        112
## X0001.HK
               1
                  0.95 - 0.03
                              0.00 -0.01
                                           0.01 0.86 0.14
## X0004.HK
                        0.03 -0.12 -0.05 -0.02 0.75 0.25
                  0.94
## X0016.HK
                  0.90 -0.01
                              0.10 -0.02 -0.05 0.81 0.19
              10
## X0388.HK
                  0.89 -0.02
                               0.00 0.01 -0.02 0.77 0.23
              25
##
  X0101.HK
              16
                  0.87
                        0.01
                               0.03 - 0.19
                                           0.07 0.69 0.31
## X0012.HK
               8
                  0.87 -0.10
                               0.13 -0.06
                                           0.04 0.75 0.25
## X0011.HK
               7
                  0.85 - 0.15
                               0.10
                                    0.16 -0.07 0.77 0.23
## X0017.HK
                  0.85 -0.10 -0.06 -0.15
                                          0.13 0.59 0.41
              11
## X0083.HK
                  0.84
                        0.01
                              0.07 - 0.14
                                           0.02 0.68 0.32
## X2318.HK
              43
                  0.84
                         0.21 -0.08 -0.04 -0.09 0.76 0.24
## X0013.HK
                  0.84
                         0.03 -0.03 -0.01 0.08 0.79 0.21
               9
                  0.78
                        0.34 -0.24 -0.08 -0.07 0.75 0.25
## X0688.HK
              27
## X1398.HK
                  0.77
                         0.28
                               0.04
                                     0.00 -0.13 0.85 0.15
              40
## X2388.HK
              44
                  0.77
                        0.11
                               0.06
                                     0.16 -0.18 0.76 0.24
## X2600.HK
                  0.74
                        0.26 -0.03 -0.08 -0.09 0.68 0.32
              45
## X1109.HK
              37
                  0.73
                        0.30 -0.33 -0.01
                                           0.05 0.75 0.25
## X0023.HK
                  0.68
                        0.07
                               0.11
                                     0.24 -0.23 0.67 0.33
              13
## X3328.HK
                  0.68
                        0.31
                               0.06 -0.05
                                          0.00 0.81 0.19
              47
## X3988.HK
                  0.66
                                     0.04 -0.04 0.75 0.25
                        0.20
                               0.12
              48
## X0005.HK
               5
                  0.63
                        0.25
                               0.11
                                     0.01
                                           0.02 0.79 0.21
                                           0.01 0.70 0.30
## X1898.HK
              42
                  0.62
                         0.21
                               0.11
                                     0.01
## X0939.HK
                  0.62
                        0.30
                               0.10
                                     0.06 -0.07 0.78 0.22
              33
## X0267.HK
                  0.61
                        0.02 -0.05
                                     0.20
                                           0.17 0.72 0.28
              19
## X0293.HK
              21
                  0.60
                        0.16 - 0.21
                                     0.06
                                           0.13 0.57 0.43
## X2628.HK
              46
                  0.55
                         0.24
                              0.12
                                     0.01 -0.01 0.62 0.38
## X0291.HK
                         0.08 -0.02 -0.04
              20
                  0.55
                                           0.10 0.41 0.59
## X1199.HK
                  0.54
                         0.41 -0.04 -0.11
                                           0.14 0.76 0.24
              38
## X1299.HK
              39
                  0.50
                         0.10
                               0.06
                                     0.10
                                           0.09 0.51 0.49
## X0883.HK
                                     0.02
              32
                  0.46
                        0.44
                               0.12
                                           0.03 0.79 0.21
## X0019.HK
                  0.46 -0.13
                               0.07
                                     0.27
                                            0.06 0.43 0.57
              12
                                     0.08
## X1088.HK
              36
                  0.43
                       0.34
                               0.15
                                           0.09 0.76 0.24
## X0066.HK
                  0.41 -0.14
                               0.35
                                     0.22
                                           0.11 0.61 0.39
              14
## X0494.HK
              26
                  0.41
                         0.25
                             -0.01
                                     0.14
                                           0.02 0.48 0.52
## X0700.HK
                  0.48
                         0.59 -0.07
                                     0.01 -0.21 0.72 0.28
              28
##
  X0762.HK
              29
                 -0.08
                         0.55
                               0.30
                                     0.21
                                           0.08 0.63 0.37
  X0386.HK
                  0.00
                               0.41
                                    -0.20
                                           0.28 0.74 0.26
              24
                         0.53
## X1880.HK
              41
                  0.34
                         0.45 - 0.13
                                     0.17 -0.05 0.54 0.46
## X0144.HK
                  0.30
                        0.45 -0.01
                                     0.09
                                           0.19 0.71 0.29
              17
## X0857.HK
                  0.25
                        0.38
                              0.31 -0.07
                                           0.23 0.75 0.25
              31
## X0002.HK
                  0.07
                         0.03
                               0.84 -0.03 -0.22 0.67 0.33
## X0006.HK
               6 -0.11
                         0.27
                               0.77 -0.27 -0.31 0.60 0.40
## X0003.HK
               3
                  0.06 -0.27
                               0.71
                                     0.10
                                           0.18 0.63 0.37
## X0941.HK
              34 -0.06
                        0.25
                               0.64
                                     0.08
                                           0.11 0.65 0.35
## X0322.HK
                  0.01 -0.08 -0.04
                                     0.87 -0.11 0.65 0.35
              22
## X0151.HK
              18 -0.24
                        0.26 -0.07
                                     0.77
                                           0.17 0.67 0.33
## X1044.HK
              35 -0.06
                        0.43 -0.06
                                     0.61 -0.03 0.62 0.38
## X0836.HK
              30 -0.18
                        0.05 -0.11
                                     0.04
                                           0.89 0.63 0.37
## X0330.HK
              23 0.14
                        0.04 -0.13 -0.11 0.67 0.48 0.52
##
```

```
PC1 PC4 PC2 PC3 PC5
## SS loadings
                 19.37 5.71 3.34 2.52 1.93
## Proportion Var 0.40 0.12 0.07 0.05 0.04
## Cumulative Var 0.40 0.52 0.59 0.64 0.68
##
##
   With component correlations of
##
       PC1 PC4 PC2 PC3 PC5
## PC1 1.00 0.62 0.46 0.60 0.61
## PC4 0.62 1.00 0.32 0.37 0.41
## PC2 0.46 0.32 1.00 0.30 0.35
## PC3 0.60 0.37 0.30 1.00 0.42
## PC5 0.61 0.41 0.35 0.42 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 52.96 0.3
## The degrees of freedom for the model are 898 and the objective function was 10.35
## 0.3The number of observations was 159 with Chi Square = 1427 with prob < 8.9e-27
## 0.3
## Fit based upon off diagonal values = 1
##
                            PC4
                  PC1
## X0001.HK 0.9482593 -0.027986
## X0002.HK 0.0700823 0.028342
## X0003.HK 0.0649525 -0.267842
## X0004.HK 0.9361110 0.028423
## X0005.HK 0.6313016 0.253597
## X0006.HK -0.1094378 0.265411
## X0011.HK 0.8519781 -0.154476
## X0012.HK 0.8657499 -0.097936
## X0013.HK 0.8355904 0.026150
## X0016.HK 0.9030536 -0.011861
## X0017.HK
            0.8494096 -0.104937
## X0019.HK
            0.4565247 -0.130078
## X0023.HK
            0.6788725 0.068029
## X0066.HK 0.4102046 -0.144945
## X0083.HK
            0.8434246 0.007676
## X0101.HK
            0.8687264 0.008268
## X0144.HK
            0.3002192 0.450140
## X0151.HK -0.2365375 0.264513
## X0267.HK
            0.6095363 0.018681
## X0291.HK 0.5514068 0.082053
## X0293.HK 0.5969088 0.163772
## X0322.HK 0.0107707 -0.083649
## X0330.HK 0.1383055 0.035792
## X0386.HK 0.0009476 0.529150
## X0388.HK 0.8940087 -0.020484
## X0494.HK 0.4081231
                      0.251591
## X0688.HK
            0.7762467
                      0.344733
## X0700.HK 0.4817987
                      0.590625
## X0762.HK -0.0784653
                      0.547665
## X0836.HK -0.1814892 0.052376
## X0857.HK 0.2501456
                      0.384858
## X0883.HK 0.4565812
                      0.435685
## X0939.HK 0.6172742
                       0.301355
## X0941.HK -0.0561003
                       0.251089
## X1044.HK -0.0575886 0.428807
```

```
## X1088.HK 0.4305790 0.344023

## X1109.HK 0.7290813 0.296978

## X1199.HK 0.5426342 0.406211

## X1299.HK 0.4963106 0.098888

## X1398.HK 0.7714132 0.279591

## X1880.HK 0.3358808 0.453199

## X1898.HK 0.6199024 0.211081

## X2318.HK 0.8409033 0.208236

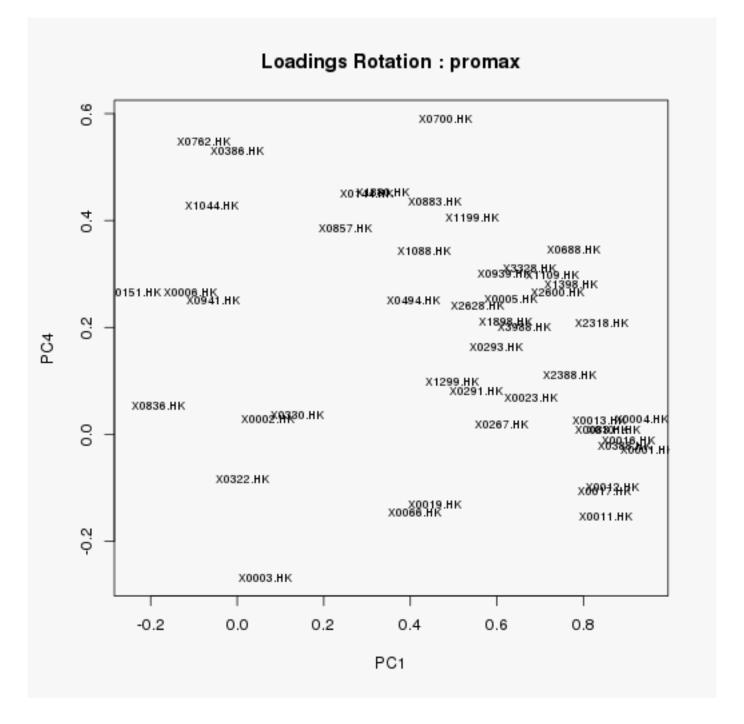
## X2388.HK 0.7678129 0.111611

## X2600.HK 0.7402450 0.264761

## X2628.HK 0.5538083 0.240731

## X3328.HK 0.6767719 0.311319

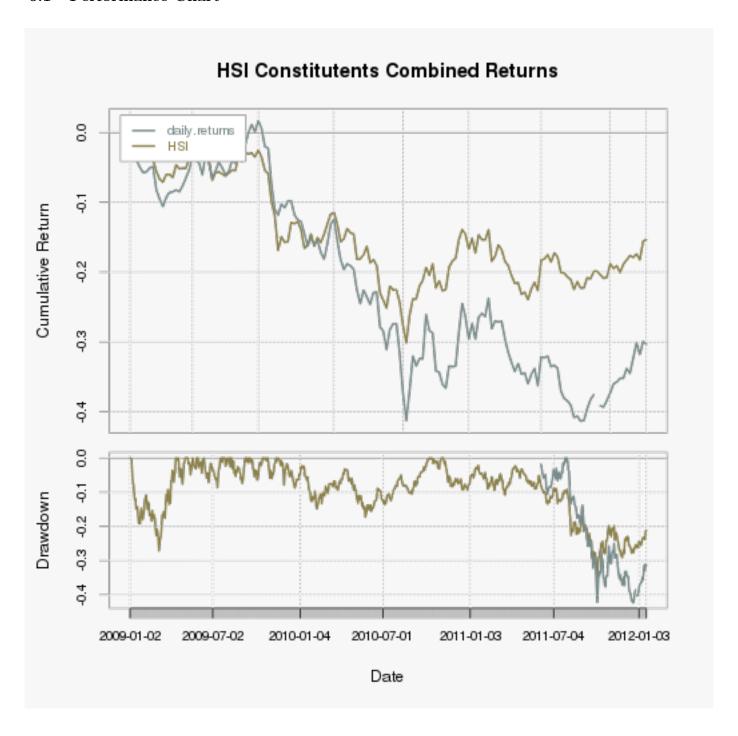
## X3988.HK 0.6645101 0.200514
```



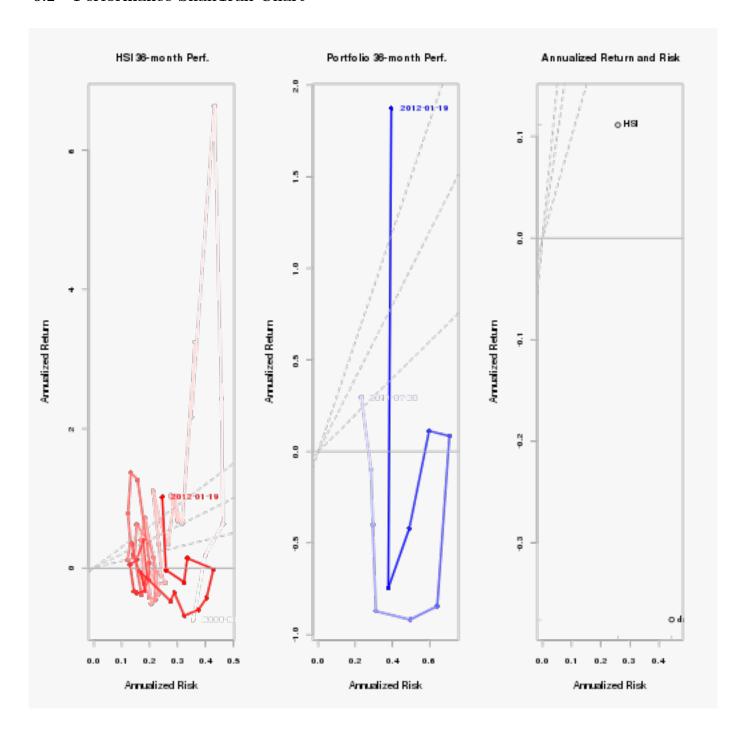
PCA is a science in itself and can not be fully covered and even less interpreted in this paper. The factors produced by principal component analysis are conceptualized as being linear combinations of the variables whereas the factors produced by common factor analysis are conceptualized as being latent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

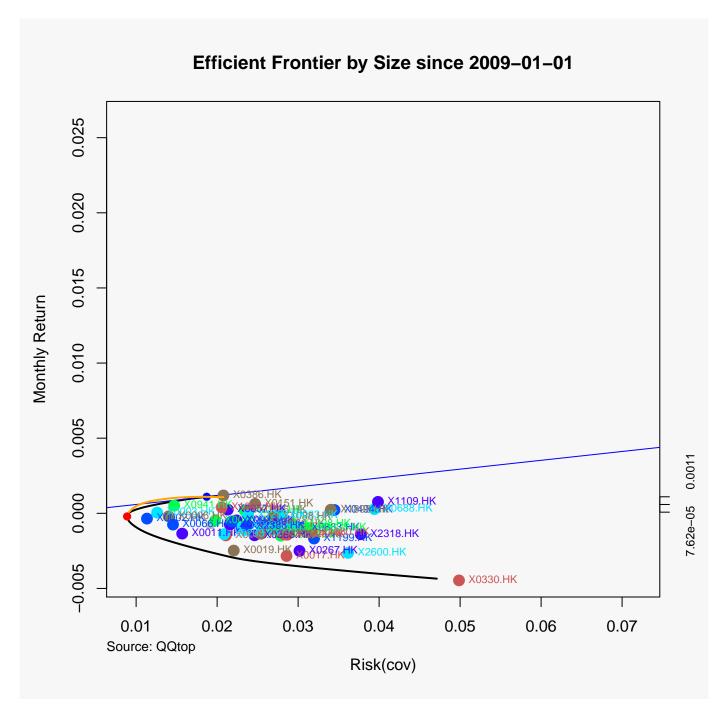
6.1 Performance Chart



6.2 Performance SnailTrail Chart



6.3 HSI Components Frontier



```
## Title:
##
   MV Portfolio Frontier
##
   Estimator:
                       {\tt 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
        0.0000
                   0.0000
##
   13
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   25
        0.0000
                   0.1449
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.2496
                                                                    0.1710
                                                                              0.0000
                  0.2608
                                      0.0000
                                                                    0.0000
##
   37
        0.0000
                            0.2298
                                                0.0000
                                                          0.2187
                                                                              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
                            0.0710
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
        0.0000
##
   13
                   0.0000
                            0.2560
                                      0.5460
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   25
        0.0000
                   0.0000
                            0.0835
                                      0.2807
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   37
        0.0000
                   0.0000
                            0.0000
                                      0.0020
                                                0.0000
                                                          0.0546
                                                                    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
##
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.9290
   1
                                                                              0.0000
##
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.1980
                                                                              0.0000
   13
##
   25
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0704
                                                                              0.0000
##
   37
         0.0000
                   0.0079
                            0.0000
                                      0.0002
                                                0.0530
                                                          0.0540
                                                                    0.0000
                                                                              0.0000
##
   49
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              1.0000
##
      X0388.HK X0494.HK X0688.HK X0700.HK
                                              X0762.HK X0836.HK
                                                                 X0857.HK
                                                                           X0883.HK
##
                                      0.0000
   1
        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
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
##
   25
         0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   37
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0688
                                                                    0.0000
                                                                              0.0000
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                                    0.0000
##
   49
                                                0.0000
                                                          0.0000
                                                                              0.0000
##
      X0939.HK X0941.HK X1044.HK X1088.HK X1109.HK X1199.HK X1299.HK
                                                                           X1398.HK
                                      0.0000
                                                0.0000
##
   1
         0.0000
                   0.0000
                            0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
                                                          0.0000
##
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                                    0.0000
                                                                              0.0000
  13
##
  25
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   37
         0.0000
                   0.0000
                            0.0503
                                      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
##
         0.0000
   1
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   13
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   25
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   37
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   49
         0.0000
                   0.0000
                             0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
##
   Covariance Risk Budgets:
##
      X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK X0006.HK X0011.HK X0012.HK
##
   1
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   13
        0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
   25
        0.0000
                   0.0709
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.1065
                                                                    0.1547
                                                                              0.0000
##
   37
        0.0000
                   0.2605
                            0.2302
                                      0.0000
                                                0.0000
                                                          0.2186
                                                                    0.0000
                                                                              0.0000
##
   49
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
##
      X0013.HK X0016.HK X0017.HK X0019.HK
                                              X0023.HK
                                                        X0066.HK
                                                                  X0083.HK
                                                                           X0101.HK
                                                0.0000
         0.0000
                   0.0000
                            0.0178
                                      0.0000
                                                          0.0000
##
   1
                                                                    0.0000
                                                                              0.0000
##
        0.0000
                   0.0000
                            0.2430
                                      0.4381
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
   13
##
   25
        0.0000
                   0.0000
                            0.1273
                                      0.3857
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              0.0000
                            0.0000
##
   37
        0.0000
                   0.0000
                                      0.0019
                                                0.0000
                                                          0.0544
                                                                    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
                                                                    0.9822
                                                                              0.0000
## 13
         0.0000
                   0.0000
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.3189
                                                                              0.0000
   25
        0.0000
                   0.0000
##
                            0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.1549
                                                                              0.0000
##
   37
        0.0000
                   0.0080
                                      0.0002
                            0.0000
                                                0.0526
                                                          0.0542
                                                                    0.0000
                                                                              0.0000
##
         0.0000
                   0.0000
                             0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
                                                                              1.0000
   49
##
      X0388.HK X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK X0857.HK X0883.HK
         0.0000
                   0.0000
                             0.0000
                                      0.0000
                                                0.0000
                                                          0.0000
                                                                    0.0000
##
                                                                              0.0000
  1
```

```
## 13
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000 0.0000
                                                               0.0000
                                                                        0.0000
## 25
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                     0.0000
                                                               0.0000
                                                                        0.0000
## 37
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                     0.0689
                                                               0.0000
                                                                        0.0000
## 49
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                      0.0000
                                                               0.0000
                                                                        0.0000
      X0939.HK X0941.HK X1044.HK X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
##
## 1
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                      0.0000
                                                               0.0000
                                                                        0.0000
## 13
                 0.0000
        0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                     0.0000
                                                               0.0000
                                                                        0.0000
## 25
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                     0.0000
                                                               0.0000
                                                                        0.0000
## 37
        0.0000
                 0.0000
                          0.0505
                                   0.0000
                                            0.0000
                                                     0.0000
                                                               0.0000
                                                                        0.0000
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                      0.0000
                                                               0.0000
                                                                        0.0000
## 49
##
      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
                                   0.0000
                                            0.0000
                                                      0.0000
## 13
        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
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                      0.0000
                                                               0.0000
                                                                        0.0000
## 37
## 49
        0.0000
                 0.0000
                          0.0000
                                   0.0000
                                            0.0000
                                                     0.0000
                                                               0.0000
                                                                        0.0000
##
## Target Return and Risks:
                                         CVaR
                                                  VaR
##
         mean
                          Cov
                                Sigma
                   mu
## 1 -0.0043 -0.0043 0.0471
                              0.0471 0.1242 0.0816
## 13 -0.0030 -0.0030 0.0221
                               0.0221 0.0587
                                               0.0440
## 25 -0.0016 -0.0016 0.0126
                               0.0126 0.0317
                                               0.0266
## 37 -0.0002 -0.0002 0.0089
                               0.0089 0.0192 0.0167
## 49 0.0012 0.0012 0.0208
                               0.0208 0.0428
                                               0.0277
##
## Description:
## Fri Jan 20 19:54:49 2012 by user:
```

7 HSI Components Ratios

7.1 Sharpe Ratio - Combined

```
## Annualized StdDev Sharpe (Rf=0%, p=95%): -0.8467
## Annualized VaR Sharpe (Rf=0%, p=95%): -8.5734
## Annualized ES Sharpe (Rf=0%, p=95%): -6.7600
```

7.2 Sharpe - Distinct

```
##
                                             X0001.HK X0002.HK X0003.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                                         0.4347
                                               0.3214
                                                                   0.605
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               3.4241
                                                         4.3725
                                                                   5.780
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               2.6659
                                                         3.0772
                                                                   2.493
##
                                             X0004.HK X0005.HK X0006.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.5937
                                                        -0.1747
                                                                   0.437
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               6.4842
                                                        -1.8160
                                                                   4.471
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               5.0996
                                                        -0.8792
                                                                   3.192
##
                                             X0011.HK X0012.HK X0013.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                              -0.0897
                                                         0.3549
                                                                   0.639
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               -1.0315
                                                         3.9252
                                                                   7.000
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               -0.9845
                                                         3.1242
                                                                   5.419
##
                                             X0016.HK X0017.HK X0019.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.5198 -0.0236
                                                                  0.3503
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               5.5516
                                                       -0.2483
                                                                  3.4648
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               4.3352 -0.1739
                                                                  2.0442
##
                                              X0023.HK X0066.HK X0083.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.6049
                                                         0.5002
                                                                  0.3365
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               7.5000
                                                         5.8448
                                                                  3.5548
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               7.3644
                                                         4.9882
                                                                  2.5936
##
                                             X0101.HK X0144.HK X0151.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.3096
                                                         0.3777
                                                                  0.9575
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                                         4.0535
                                               3.3827
                                                                 10.2587
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               2.6852
                                                         3.2208
                                                                  7.7426
##
                                             X0267.HK X0291.HK X0293.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.2605
                                                         0.6678
                                                                  0.4878
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               3.0175
                                                         7.2276
                                                                  5.0974
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               2.5715
                                                         5.7859
                                                                  3.8122
##
                                             X0322.HK X0330.HK X0386.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                                 1.117
                                                         -0.696
                                                                  0.6693
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               15.276
                                                         -6.403
                                                                  6.8914
## Annualized ES Sharpe (Rf=0%, p=95%):
                                                         -3.418
                                               15.276
                                                                  5.1825
##
                                              X0388.HK X0494.HK X0688.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.5406
                                                         -0.162
                                                                  0.2199
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               6.1209
                                                         -1.637
                                                                  2.5563
## Annualized ES Sharpe (Rf=0%, p=95%):
                                                         -1.339
                                                                  2.2036
                                               4.9925
##
                                             X0700.HK X0762.HK X0836.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                                          0.399
                                                                 -0.0077
                                                 1.284
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               13.573
                                                          4.447
                                                                 -0.0789
## Annualized ES Sharpe (Rf=0%, p=95%):
                                                                 -0.0627
                                               10.081
                                                          3.563
##
                                             X0857.HK X0883.HK X0939.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                                 0.481
                                                          0.661
                                                                  0.3144
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                                 4.839
                                                          6.918
                                                                  3.1150
## Annualized ES Sharpe (Rf=0%, p=95%):
                                                 3.667
                                                          5.195
                                                                  2.1627
                                             X0941.HK X1044.HK X1088.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               -0.0814
                                                          1.171
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                                         12.954
                                               -0.8584
                                                                  6.7206
## Annualized ES Sharpe (Rf=0%, p=95%):
                                                         10.060
                                               -0.6621
                                                                  5.1598
##
                                              X1109.HK X1199.HK X1299.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.2291
                                                         0.2025
                                                                  0.2916
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               2.6953
                                                         2.2290
                                                                  3.0034
## Annualized ES Sharpe (Rf=0%, p=95%):
                                               2.3298
                                                                  1.8932
                                                         1.7914
##
                                             X1398.HK X1880.HK X1898.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                               0.2292
                                                          1.147
                                                                  0.3087
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                               2.5813
                                                         13.030
                                                                  3.0216
```

```
## Annualized ES Sharpe (Rf=0%, p=95%):
                                              2.1065 10.293
                                                                2.0484
##
                                            X2318.HK X2388.HK X2600.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                              0.3306
                                                       0.8873 -0.0791
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                              3.4995 10.1602 -0.8412
## Annualized ES Sharpe (Rf=0%, p=95%):
                                              2.5087
                                                       8.2283 -0.6660
##
                                            X2628.HK X3328.HK X3988.HK
## Annualized StdDev Sharpe (Rf=0%, p=95%):
                                            -0.1200
                                                       0.0138
                                                                0.4404
## Annualized VaR Sharpe (Rf=0%, p=95%):
                                             -1.1929
                                                       0.1398
## Annualized ES Sharpe (Rf=0%, p=95%):
                                             -0.8341
                                                       0.1033
                                                                3.3557
```

7.3 Information Ratio - Combined

```
## [1] "Information Ratio : -0.5836"
```

7.4 Information Ratio - Distinct

```
##
                          X0001.HK X0002.HK X0003.HK X0004.HK X0005.HK
                                             0.1061
                                                      0.4466 -0.6951
## Information Ratio: HSI
                           -0.048 -0.2093
                          X0006.HK X0011.HK X0012.HK X0013.HK X0016.HK
                                    -0.657
                                             0.0574
## Information Ratio: HSI
                           -0.122
                                                       0.4467
##
                          X0017.HK X0019.HK X0023.HK X0066.HK X0083.HK
## Information Ratio: HSI -0.4154
                                    0.0072
                                             0.3961
                                                       0.0062
                                                                0.0988
##
                          X0101.HK X0144.HK X0151.HK X0267.HK X0291.HK
                                    0.1922
## Information Ratio: HSI
                           0.0543
                                             0.6197
                                                       0.0077
##
                          X0293.HK X0322.HK X0330.HK X0386.HK X0388.HK
## Information Ratio: HSI
                           0.2011
                                    0.7228
                                             -1.027
                                                      0.4969
                                                                0.4085
##
                         X0494.HK X0688.HK X0700.HK X0762.HK X0836.HK
## Information Ratio: HSI
                           0.3583 -0.0431
                                              1.264
                                                      0.1009
                         X0857.HK X0883.HK X0939.HK X0941.HK X1044.HK
##
## Information Ratio: HSI
                           0.2753
                                    0.6468 -0.0488 -0.6926
##
                         X1088.HK X1109.HK X1199.HK X1299.HK X1398.HK
## Information Ratio: HSI
                           0.6184
                                    0.0063
                                            -0.035
                                                      0.8526
                                                                -0.158
##
                          X1880.HK X1898.HK X2318.HK X2388.HK X2600.HK
## Information Ratio: HSI
                             1.014
                                     0.1137
                                             0.1135
                                                       0.7422 -0.4461
                          X2628.HK X3328.HK X3988.HK
## Information Ratio: HSI -0.7223 -0.5497 0.1766
```

8 HSI Components Table Latest Quotes

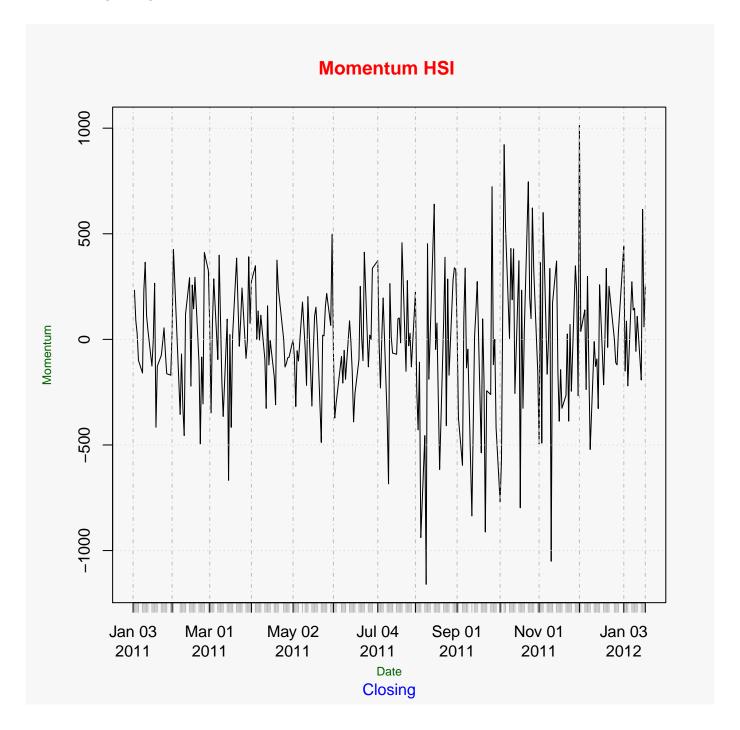
```
## [1] "Date : 2012-01-20 02:59:00"
##
                                      Ask Change
                                                   52-week Range
                      Name
                               Bid
## 0001.HK
               CHEUNG KONG 103.90 104.30
                                            0.50
                                                  79.10 - 137.60
              CLP HOLDINGS
## 0002.HK
                            62.75
                                   62.95
                                            0.45
                                                   59.85 - 75.20
## 0003.HK HK & CHINA GAS
                                   18.30
                                            0.28
                                                   16.70 - 19.68
                            18.22
## 0004.HK
           WHARF HOLDINGS
                            42.70
                                   42.90
                                            0.35
                                                   33.15 - 63.80
## 0005.HK
            HSBC HOLDINGS
                            64.50
                                    64.55
                                            2.30
                                                   56.35 - 91.90
## 0006.HK
             POWER ASSETS
                            53.00
                                    53.30
                                           -0.25
                                                   48.10 - 64.80
## 0011.HK HANG SENG BANK
                                   99.35
                                            1.45
                                                  84.40 - 134.40
                            99.30
## 0012.HK HENDERSON LAND
                            42.35
                                   42.50
                                           -1.00
                                                   33.20 - 61.50
## 0013.HK
                 HUTCHISON
                           73.05
                                    73.15
                                           1.00
                                                   53.60 - 97.45
## 0016.HK
                   SHK PPT 109.10 109.30
                                            1.20
                                                  85.45 - 147.00
## 0017.HK
             NEW WORLD DEV
                             8.09
                                            0.17
                                                    7.00 - 17.98
                                     8.10
                                                  79.30 - 137.20
## 0019.HK SWIRE PACIFIC A
                            79.05
                                    79.10
                                            1.95
## 0023.HK BANK OF E ASIA
                            30.95
                                    31.05
                                            0.80
                                                   21.85 - 36.60
## 0066.HK MTR CORPORATION
                            25.35
                                    25.40
                                            0.35
                                                   22.45 - 31.55
                                                   9.33 - 18.90
## 0083.HK
                 SINO LAND
                            12.40
                                   12.50
                                            0.02
## 0101.HK
             HANG LUNG PPT
                            26.05
                                    26.25
                                           -0.30
                                                   20.85 - 40.50
## 0144.HK CHINA MER HOLD
                            25.35
                                    25.40
                                            0.35
                                                   19.00 - 37.60
## 0151.HK WANT WANT CHINA
                             7.50
                                    7.51
                                           -0.24
                                                     5.68 - 8.30
             CITIC PACIFIC
                                                   10.26 - 24.60
## 0267.HK
                            14.34
                                    14.40
                                            0.20
                                                   24.10 - 35.50
## 0291.HK CHINA RESOURCES
                            27.55
                                    27.70
                                            0.10
## 0293.HK
           CATHAY PAC AIR
                            14.64
                                   14.68
                                            0.28
                                                   11.80 - 24.10
## 0322.HK
                    TINGYI
                            23.35
                                    23.40
                                           -0.20
                                                   17.32 - 26.00
## 0330.HK ESPRIT HOLDINGS
                            11.36
                                   11.40
                                            0.18
                                                    7.55 - 45.65
              SINOPEC CORP
                                     9.03
                                           -0.07
## 0386.HK
                             9.02
                                                     6.22 - 8.90
## 0388.HK
                      HKEX 131.60 131.70
                                           1.00
                                                  99.15 - 198.60
                            17.14 17.20
                                            0.30
                                                   10.82 - 51.95
## 0494.HK
                 LI & FUNG
## 0688.HK
           CHINA OVERSEAS
                            15.14 15.18
                                            0.32
                                                    9.99 - 17.86
                                            2.20 139.90 - 230.80
## 0700.HK
                   TENCENT 181.40 181.80
                                                   10.24 - 17.68
## 0762.HK
              CHINA UNICOM
                            14.66
                                   14.68
                                            0.16
## 0836.HK CHINA RES POWER
                                   14.68
                                           -0.32
                                                   10.82 - 16.44
                           14.66
                                                   8.59 - 12.50
## 0857.HK
                PETROCHINA
                            11.32 11.34
                                            0.00
## 0883.HK
                     CNOOC
                            15.52
                                   15.54
                                            0.04
                                                   11.20 - 21.30
## 0939.HK
                                                     4.41 - 8.47
                       CCB
                             6.07
                                     6.08
                                            0.00
                                                   68.05 - 83.80
## 0941.HK
              CHINA MOBILE
                            76.70
                                   76.75
                                            0.50
## 1044.HK
              HENGAN INT'L
                                   70.20
                                                   54.10 - 75.40
                            70.15
                                           -1.15
## 1088.HK
             CHINA SHENHUA
                            34.75
                                    34.80
                                           -0.10
                                                   27.10 - 40.20
## 1109.HK
           CHINA RES LAND
                            13.84
                                   13.90
                                            0.18
                                                    7.28 - 17.24
## 1199.HK
             COSCO PACIFIC
                            10.86
                                   10.88
                                            0.14
                                                    7.52 - 17.16
## 1299.HK
                                    25.85
                                            0.20
                                                   19.84 - 29.90
                       AIA
                            25.80
## 1398.HK
                      ICBC
                             5.37
                                     5.38
                                           -0.06
                                                     3.46 - 6.90
## 1880.HK
               BELLE INT'L
                            12.48
                                   12.52
                                            0.12
                                                   11.56 - 17.54
                                                    6.59 - 15.08
## 1898.HK
                CHINA COAL
                             9.89
                                    9.90
                                           -0.02
## 2318.HK
                   PING AN
                                                   37.35 - 96.25
                            59.10
                                   59.25
                                           -0.45
## 2388.HK
             BOC HONG KONG
                            20.60
                                    20.65
                                            0.40
                                                   14.24 - 29.40
## 2600.HK
                    CHALCO
                             3.98
                                    4.00
                                          -0.03
                                                     3.20 - 8.30
                                                   17.04 - 36.90
## 2628.HK
                                            0.45
                CHINA LIFE
                           22.10
                                   22.15
## 3328.HK
                  BANKCOMM
                              6.02
                                     6.05
                                            0.02
                                                     4.15 - 9.53
## 3988.HK
             BANK OF CHINA
                             3.27 3.28 -0.03
                                                     2.20 - 5.02
```

9 Hang Seng Index

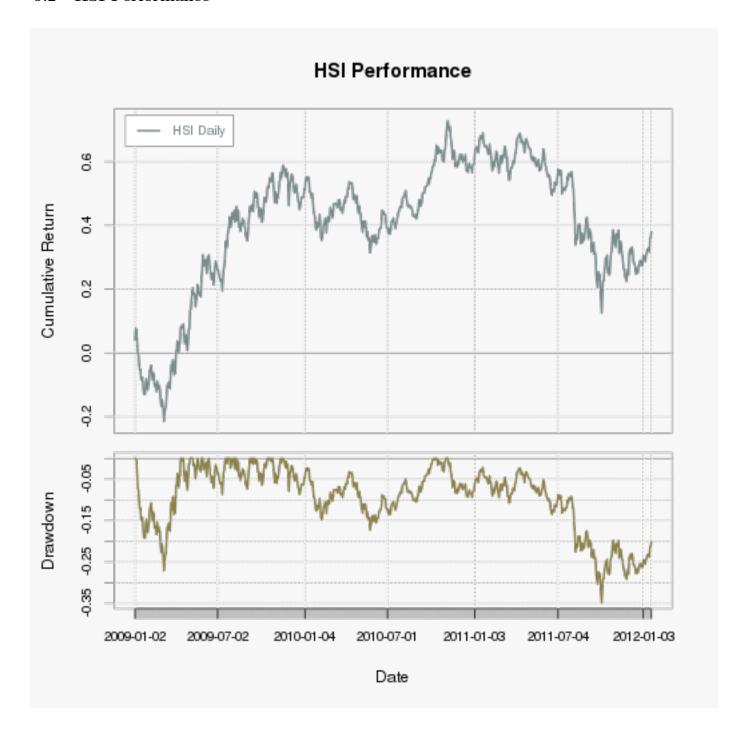
Latest Hang Seng Index

	Trade Time	Name	Last	Change	Days Range	52-week Range
^HS	2012-01-20 03:01:00	HANG SENG INDEX	20110	167.4	19927.881 – 20161.721	16170.30 – 24468.60

9.1 Hang Seng Index - Momentum

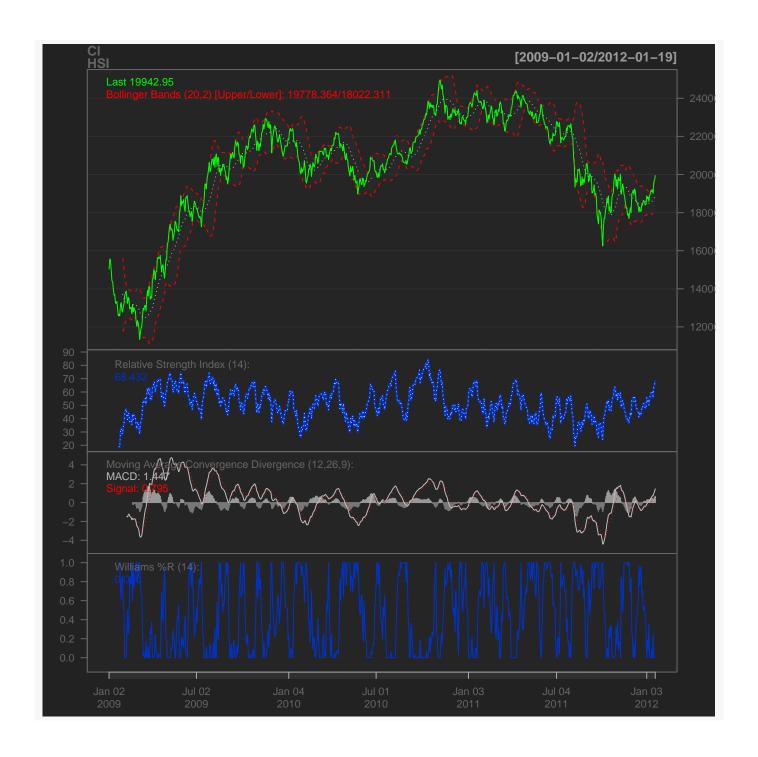


9.2 HSI Performance

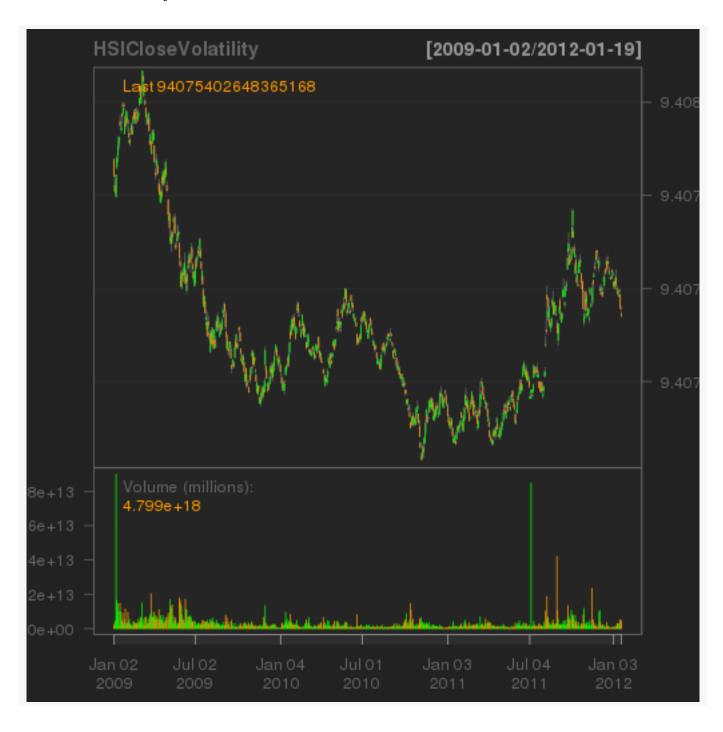


9.3 HSI Ratios

```
##
## 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
## 2012-01-16 55.43
## 2012-01-17 64.62
## 2012-01-18 65.36
## 2012-01-19 68.43
##
               macd signal
## 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
## 2012-01-16 0.7232 0.3722
## 2012-01-17 0.9781 0.4934
## 2012-01-18 1.1897 0.6326
## 2012-01-19 1.4466 0.7954
## [1] "BBands"
##
                dn mavg up pctB
## 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
## 2012-01-16 17996 18659 19322 0.7662
## 2012-01-17 17964 18726 19489 1.0912
## 2012-01-18 17999 18807 19616 1.0442
## 2012-01-19 18022 18900 19778 1.0937
##
             WPR %
## 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
## 2012-01-16 23.83
## 2012-01-17 0.00
## 2012-01-18 0.00
## 2012-01-19 0.00
```



9.4 HSI Volatility



9.5 HSI Statistics

```
## HSI-Daily HSI-Monthly

## Annualized StdDev Sharpe (Rf=0%, p=95%): 0.4294 0.3977

## Annualized VaR Sharpe (Rf=0%, p=95%): 4.4066 0.9547

## Annualized ES Sharpe (Rf=0%, p=95%): 3.2587 0.7505

## HSI-Daily HSI-Monthly

## Skewness 0.1213 0.1141

## HSI-Daily HSI-Monthly

## Kurtosis 1.383 -0.04988
```

```
## Index HSI Daily
## Min. :2009-01-02 Min. :-0.056605
## 1st Qu.:2009-10-07
                     1st Qu.:-0.008124
## Median :2010-07-13 Median : 0.000290
## Mean :2010-07-12 Mean : 0.000551
                     3rd Qu.: 0.010193
## 3rd Qu.:2011-04-13
   Max. :2012-01-19 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 : 0.00998
## 3rd Qu.:2011-04-29 3rd Qu.: 0.03806
## Max. :2012-01-19 Max. : 0.17074
```

10 Dataset First and Last Rows Info

```
## X0001.HK.Close
## 2009-01-02 76.9
## 2012-01-19 103.5
  X0002.HK.Close
##
## 2009-01-02 52.4
## 2012-01-19
                 62.3
## X0003.HK.Close
## 2009-01-02 12.08
## 2012-01-19
                17.98
##
   X0004.HK.Close
## 2009-01-02 22.0
## 2012-01-19
  X0005.HK.Close
## 2009-01-02
             77.00
           62.25
## 2012-01-19
## X0006.HK.Close
## 2009-01-02 42.75
## 2012-01-19
                 53.55
##
  X0011.HK.Close
            104.70
## 2009-01-02
## 2012-01-19
                 97.85
  X0012.HK.Close
##
## 2009-01-02 30.35
## 2012-01-19
                 43.45
##
  X0013.HK.Close
## 2009-01-02 39.85
## 2012-01-19
                72.10
## X0016.HK.Close
## 2009-01-02
             67.3
## 2012-01-19 107.9
## X0017.HK.Close
## 2009-01-02 8.18
## 2012-01-19 7.94
## 2012-01-19
                  7.94
##
  X0019.HK.Close
## 2009-01-02 55.75
## 2012-01-19
                 77.35
##
  X0023.HK.Close
## 2009-01-02 16.68
## 2012-01-19
                 30.15
##
  X0066.HK.Close
           18.08
## 2009-01-02
## 2012-01-19
                25.05
## X0083.HK.Close
## 2009-01-02
## 2012-01-19 12.48
## X0101.HK.Close
## 2009-01-02 18.36
## 2012-01-10 26.50
## 2012-01-19
                 26.50
##
   X0144.HK.Close
## 2009-01-02 15.40
## 2012-01-19
                 25.05
  X0151.HK.Close
## 2009-01-02 3.17
## 2012-01-19
                  7.72
## X0267.HK.Close
```

```
## 2009-01-02 10.20
## 2012-01-19 14.18
## X0291.HK.Close
## 2009-01-02 14.00
## 2012-01-19
                 27.55
## X0293.HK.Close
## 2009-01-02 8.91
## 2012-01-19 14.40
## X0322.HK.Close
## 2009-01-02 8.98
## 2012-01-19 23.65
## X0330.HK.Close
## 2009-01-02 44.8
## 2012-01-19
                   11.3
## X0386.HK.Close
## 2009-01-02 4.96
## 2012-01-19
                   9.10
## X0388.HK.Close
## 2009-01-02 76.6
## 2012-01-19 130.8
## X0494.HK.Close
## 2011-06-02 17.92
## 2012-01-19 16.90
## X0688.HK.Close
## 2009-01-02 11.22
## 2012-01-19 14.90
## X0700.HK.Close
## 2009-01-01 50.0
## 2012-01-19
                 179.8
## X0762.HK.Close
## 2009-01-01 9.63
## 2012-01-19
                  14.50
## X0836.HK.Close
## 2009-01-02 15.12
## 2012-01-19 15.00
## X0857.HK.Close
## 2009-01-02 7.20
## 2012-01-19 11.32
## X0883.HK.Close
## 2009-01-02 7.59
## 2012-01-19 15.48
## X0939.HK.Close
## 2009-01-02 4.52
## 2012-01-19
## X0941.HK.Close
## 2009-01-02 81.2
## 2012-01-19
                   76.2
## X1044.HK.Close
## 2009-01-01 24.9
## 2012-01-19
                  70.9
## X1088.HK.Close
## 2009-01-02
             17.4
## 2012-01-19 35.0
## X1109.HK.Close
## 2009-01-02 9.90
## 2012-01-19 13.76
  X1199.HK.Close
##
```

```
## 2009-01-02 8.07
## 2012-01-19 10.76
## X1299.HK.Close
## 2010-10-29 23.1
## 2012-01-19 25.7
## X1398.HK.Close
## 2009-01-02 4.30
## 2012-01-19 5.44
## X1880.HK.Close
## 2009-01-02 3.50
## 2012-01-19 12.42
## X1898.HK.Close
## 2009-01-02 6.55
## 2012-01-19
                  9.92
## X2318.HK.Close
## 2009-01-02 39.60
## 2012-01-19 59.55
## X2388.HK.Close
## 2009-01-02 9.06
## 2012-01-19 20.20
## X2600.HK.Close
## 2009-01-02 4.55
## 2012-01-19 4.02
## X2628.HK.Close
## 2009-01-02 24.75
## 2012-01-19 21.70
## X3328.HK.Close
## 2009-01-02 5.91
## 2012-01-19
                  6.00
## X3988.HK.Close
## 2009-01-02 2.17
## 2012-01-19 3.30
```

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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