MODEL 1 OUTPUT

K-MEANS CLUSTERING

"Cluster size: "
[1] 159 139 137 45 270 22
[1] "Centers: "

	X300400P_64	X127300P_64	SNC_1024	X979200P_64	X106233P_64	X890100P_64	GLDSPOT_1024	X952800P_64	X302900P_64
1	0.0036	0.0062	0.0030	0.0059	0.0065	0.005405	0.0012	0.0077	0.0069
2	-0.0027	-0.0066	-0.0042	-0.0072	-0.0090	-0.006650	0.0020	-0.0114	-0.0080
3	0.0004	-0.0011	-0.0005	-0.0008	0.0019	-0.000007	-0.0041	0.0030	-0.0011
4	0.0067	0.0125	0.0012	0.0147	0.0184	0.013049	-0.0039	0.0224	0.0165
5	-0.0006	-0.0001	0.0006	-0.0002	-0.0005	0.000101	0.0004	-0.0009	-0.0005
6	-0.0143	-0.0194	-0.0040	-0.0143	-0.0257	-0.020418	0.0088	-0.0293	-0.0225

	X930000P_64	X106570P_64	X925000P_64	X907600P_64	X133717P_64	BRT_1024	X990300P_64	X123163P_64	X136636P_64
1	0.010	0.0075	0.009	0.0088	0.004621	0.008	0.0062	0.0063	0.0015
2	-0.018	-0.0112	-0.013	-0.0088	-0.005601	-0.006	-0.0089	-0.0082	-0.0030
3	0.013	0.0014	0.002	-0.0033	-0.000855	-0.018	0.0014	-0.0006	0.0010
4	0.033	0.0215	0.024	0.0139	0.011037	0.021	0.0164	0.0162	0.0020
5	-0.009	-0.0006	-0.001	0.0007	-0.000003	0.003	-0.0005	-0.0002	0.0007
6	-0.065	-0.0279	-0.032	-0.0190	-0.020057	-0.030	-0.0238	-0.0218	-0.0115

	X984000PUSD_64	URAXPD_64	PLTSPOT_1024	X990100P_64	X899600P_64	X105653P_64	ZS3M_1024	X982600P_64	X975200P_64
1	0.0049	0.010	0.0036	0.005405	0.0059	0.00786	0.007	0.00631	0.0076
2	-0.0053	-0.013	-0.0014	-0.006650	-0.0082	-0.00781	-0.004	-0.00936	-0.0111
3	-0.0008	-0.008	-0.0067	-0.000007	0.0010	-0.00292	-0.007	-0.00023	0.0008
4	0.0111	0.019	0.0012	0.013049	0.0150	0.01769	0.005	0.01939	0.0227
5	0.0005	0.002	0.0009	0.000101	-0.0004	0.00005	0.002	0.00003	-0.0004
6	-0.0183	-0.031	-0.0057	-0.020417	-0.0221	-0.02095	-0.010	-0.02452	-0.0266

	CA3M_1024	X905600P_64	X891800P_64	PLT_1024	X924600P_64	X136641P_64	X975600P_64	PLD_1024	X957800P_64	CAC_1024
1	0.005	0.008	0.004841	0.0026	0.0080	0.0054	0.0045	0.0036	0.00687	0.0029
2	-0.004	-0.010	-0.005786	-0.0020	-0.0119	-0.0043	-0.0086	-0.0035	-0.00989	-0.0043
3	-0.007	0.003	-0.000366	-0.0024	0.0022	-0.0004	0.0023	-0.0043	-0.00168	-0.0035
4	0.009	0.019	0.010185	0.0014	0.0224	0.0058	0.0178	0.0053	0.02076	0.0069
5	0.001	-0.001	0.000004	-0.0008	-0.0009	0.0013	-0.0005	0.0008	-0.00007	0.0005
6	-0.012	-0.025	-0.016057	-0.0005	-0.0279	-0.0188	-0.0231	-0.0012	-0.02318	-0.0105

	X136638P_64	URAXP_64	X848400P_64	SLVSPOT_1024	NA3M_1024	AAC_1024	X144438P_64	ZSC_1024	NIC_1024	X928000P_64
1	0.0003	0.011	0.0046	0.0051	0.0017	0.00070	0.0028	0.004	0.008	0.009
2	-0.0012	-0.014	-0.0057	-0.0007	-0.0007	-0.00012	-0.0042	-0.005	-0.007	-0.013
3	0.0002	-0.006	-0.0008	-0.0082	-0.0016	-0.00119	0.0012	-0.004	-0.009	0.003
4	0.0003	0.021	0.0116	0.0015	0.0028	-0.00572	0.0080	0.007	0.008	0.023
5	0.0005	0.002	0.0002	0.0008	-0.0003	0.00058	0.0005	0.002	0.002	-0.001
6	-0.0062	-0.033	-0.0137	0.0027	-0.0032	-0.00005	-0.0155	-0.007	-0.013	-0.030

	AH3M_1024	X892400P_64	X105766P_64	X937200P_64	X990500P_64	X144115P_64	X136635P_64	X892400PUSD_64	X920800P_64
1	0.0039	0.00535	0.0034	0.010	0.0074	0.0074	0.00052	0.0055	0.0058
2	-0.0020	-0.00656	-0.0026	-0.011	-0.0110	-0.0109	-0.00014	-0.0065	-0.0098
3	-0.0046	-0.00005	0.0038	0.003	0.0015	0.0015	0.00079	-0.0008	0.0039
4	0.0076	0.01276	0.0080	0.021	0.0213	0.0212	0.00103	0.0127	0.0187
5	0.0005	0.00009	-0.0007	-0.002	-0.0006	-0.0006	-0.00008	0.0001	-0.0005
6	-0.0095	-0.01998	-0.0116	-0.035	-0.0279	-0.0277	-0.00506	-0.0199	-0.0247

	X917000P_64	X934800P_64	X141415P_64	X136639P_64	NI3M_1024	X990700P_64	WTI_1024	X971000P_64	X106569P_64
1	0.0039	0.0076	-0.0001	0.0028	0.011	0.0071	0.008	0.0063	0.009
2	-0.0053	-0.0065	-0.0027	-0.0031	-0.005	-0.0107	-0.006	-0.0089	-0.013
3	-0.0022	0.0011	0.0010	0.0009	-0.013	0.0015	-0.019	-0.0003	0.002
4	0.0101	0.0130	0.0002	0.0084	0.011	0.0213	0.021	0.0178	0.024
5	0.0005	-0.0002	0.0004	0.0002	0.002	-0.0005	0.004	0.0003	-0.001
6	-0.0158	-0.0226	-0.0091	-0.0166	-0.019	-0.0259	-0.028	-0.0223	-0.033

	X962000P_64	X904000P_64	X984000P_64	X938000P_64	X915200P_64	X972400P_64	PB3M_1024	SN3M_1024	X144437P_64
1	0.0091	0.0104	0.0049	0.011	0.00378	0.010	0.006	0.0040	0.0073
2	-0.0138	-0.0141	-0.0053	-0.016	-0.00465	-0.014	-0.003	-0.0034	-0.0107
3	0.0008	0.0005	-0.0008	0.001	0.00016	0.002	-0.007	-0.0020	0.0015
4	0.0244	0.0230	0.0111	0.030	0.00814	0.025	0.003	0.0042	0.0208
5	-0.0013	-0.0005	0.0005	-0.001	-0.00003	-0.001	0.002	0.0001	-0.0006
6	-0.0319	-0.0326	-0.0183	-0.042	-0.01367	-0.037	-0.006	-0.0059	-0.0275

	PBC_1024	X303000P_64	AA3M_1024	X990100PUSD_64	X136634P_64	X136640P_64	X920000P_64	X661640P_64	X961600P_64
1	0.003	0.00695	-0.00009	0.0054	-0.00095	0.00090	0.0034	0.0069	0.00482
2	-0.004	-0.00758	-0.00045	-0.0064	-0.00038	-0.00213	-0.0055	-0.0097	-0.00756
3	-0.005	-0.00210	-0.00024	-0.0007	0.00128	0.00003	0.0007	0.0018	-0.00084
4	0.005	0.01611	0.00022	0.0126	-0.00236	0.00054	0.0103	0.0195	0.01379
5	0.002	-0.00003	-0.00011	0.0001	0.00005	0.00061	-0.0002	-0.0006	-0.00007
6	-0.005	-0.02140	-0.00025	-0.0199	-0.00643	-0.00592	-0.0207	-0.0268	-0.02208

	X890100PUSD_64	NAC_1024	X899902P_64	X106400P_64	X136646P_64	AHC_1024	PLDSPOT_1024
1	0.0054	0.0015	0.0049	0.009	0.00031	0.001896	0.005
2	-0.0064	-0.0002	-0.0053	-0.013	0.00046	-0.001518	-0.004
3	-0.0007	-0.0004	-0.0009	0.002	-0.00099	-0.001855	-0.009
4	0.0126	-0.0004	0.0110	0.024	0.00133	0.007391	0.007
5	0.0001	-0.0009	0.0005	-0.001	0.00035	-0.000005	0.003
6	-0.0199	0.0022	-0.0183	-0.032	0.00008	-0.008108	-0.013

```
[1] "---------------------------------------------------------------------------------"
[1] "Within cluster sum of squares by cluster:  "
[1] 1.6 1.5 1.3 0.7 1.9 0.5
between_SS/total_SS=   32 %   - poor explanation of variability!
[1] "Error! Impossible to plot clusters for this type of model!"
[1] "---------------------------------------------------------------------------------"
[1] "Frequency table:"
                  autocorrelation[, 2]
autocorrelation[, 1]  1   2   3   4   5   6
                  1 41  20  26  13  56   2
                  2 13  29  34   5  52   6
                  3 27  26  25   9  49   0
                  4  8  12   7   5   8   5
                  5 67  45  42  11  99   6
                  6  1   7   3   2   6   3
[1] "---------------------------------------------------------------------------------"
[1] "Transition probabilities: frequentist approach"
                  autocorrelation[, 2]
autocorrelation[, 1]   1    2    3    4    5    6
                  1 0.26 0.13 0.16 0.08 0.35 0.01
                  2 0.09 0.21 0.24 0.04 0.37 0.04
                  3 0.20 0.19 0.18 0.07 0.36 0.00
                  4 0.18 0.27 0.16 0.11 0.18 0.11
                  5 0.25 0.17 0.16 0.04 0.37 0.02
                  6 0.05 0.32 0.14 0.09 0.27 0.14
```
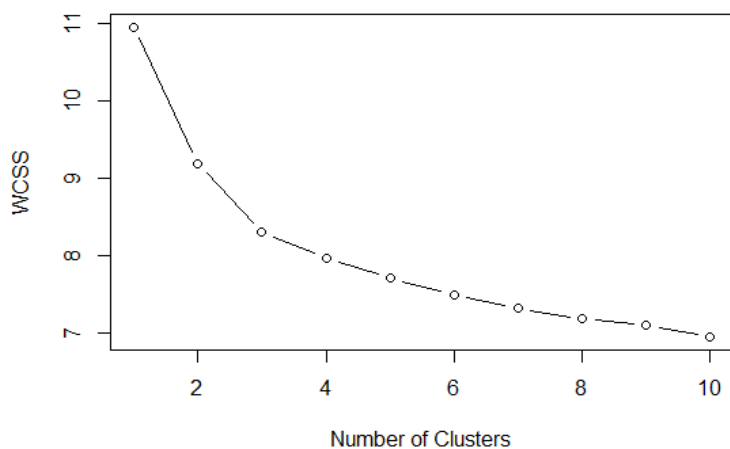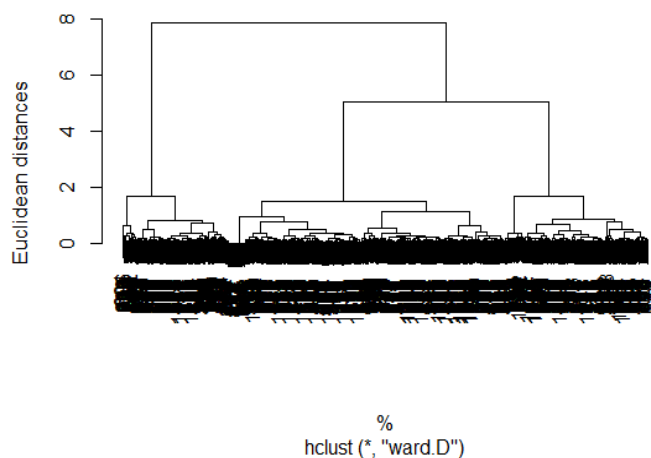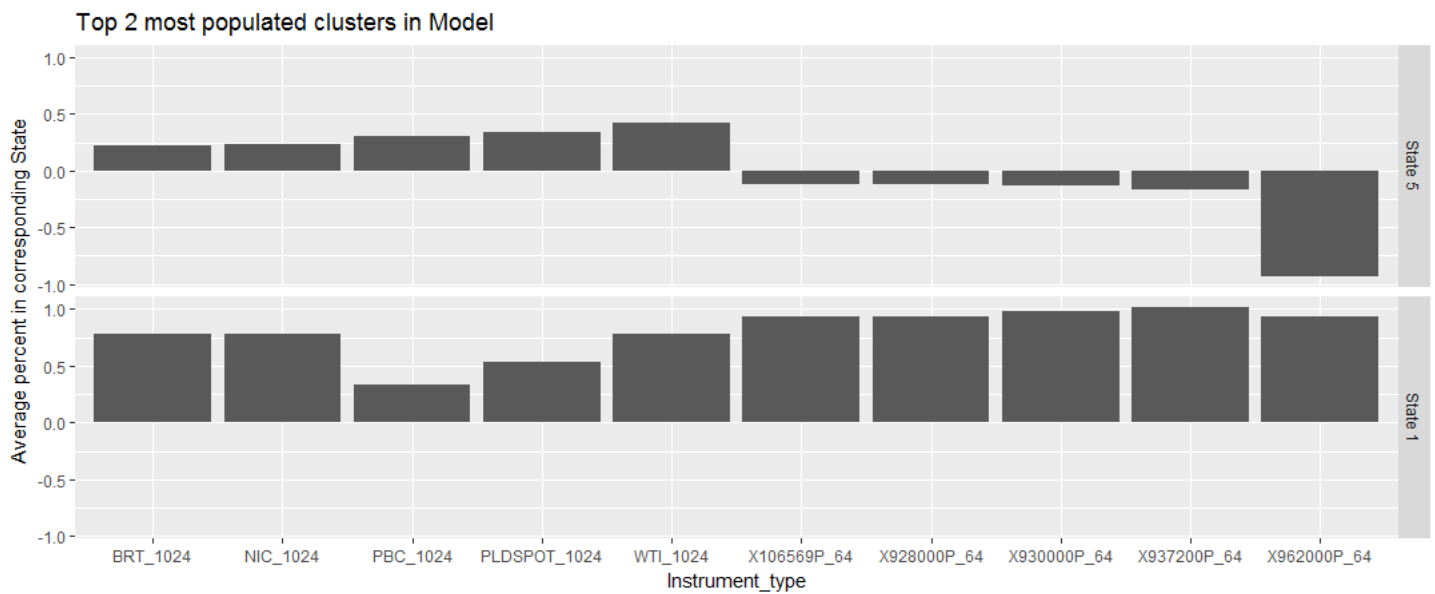

Optimal number of clusters: Elbow method, Model type 1

Optimal number of clusters: IC, Model 1
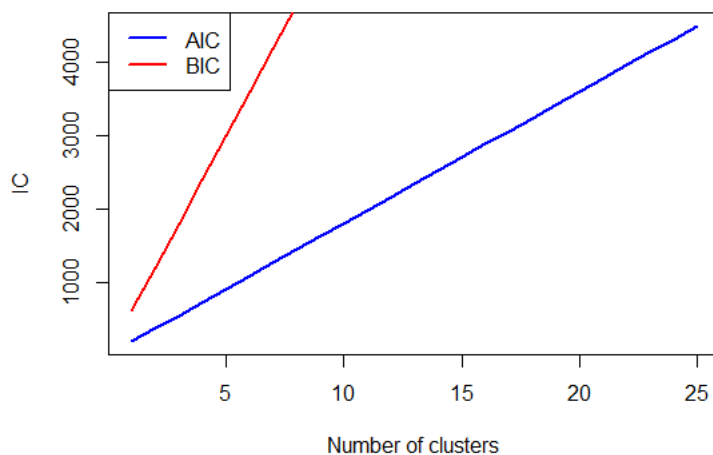
Hierarchical clustering: Model type 1

Top 2 most populated clusters in Model

MODEL 2 OUTPUT

K-MEANS CLUSTERING

```
[1] "Cluster size:  "
[1]  22 233 132 180  39 166
[1] "Centers:  "
  aver.return stddev.return
1      -1.82          1.9
2      -0.07          1.1
3      -0.71          1.1
4       0.54          1.0
5       1.31          1.6
6      -0.01          0.6
[1] "-------------------------------------------------------------------------"
[1] "Within cluster sum of squares by cluster:  "
[1] 20 19 17 16 14 17
```
between_SS/total_SS=   76 " %" – not bad.. at least better than 91-dimension model produces..
```
[1] "-------------------------------------------------------------------------"
[1] "Frequency table:"
                  autocorrelation[, 2]
autocorrelation[, 1]  1  2  3  4  5  6
                   1  2  6  7  3  0  4
                   2  6 79 45 51 12 39
                   3  7 47 31 17  4 26
                   4  1 47 22 54 15 40
                   5  5 13  7  8  4  2
                   6  1 41 20 45  4 55
[1] "-------------------------------------------------------------------------"
```
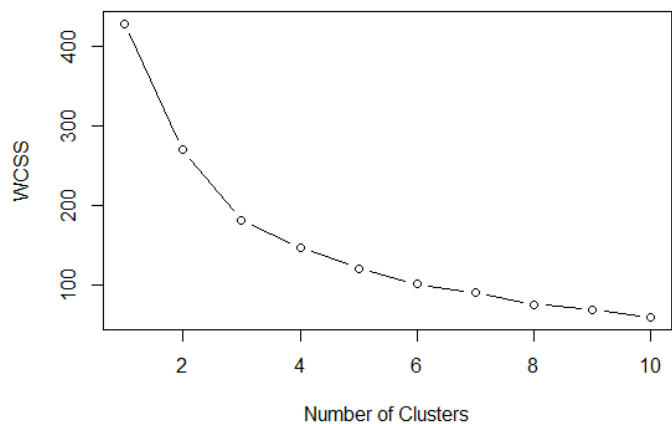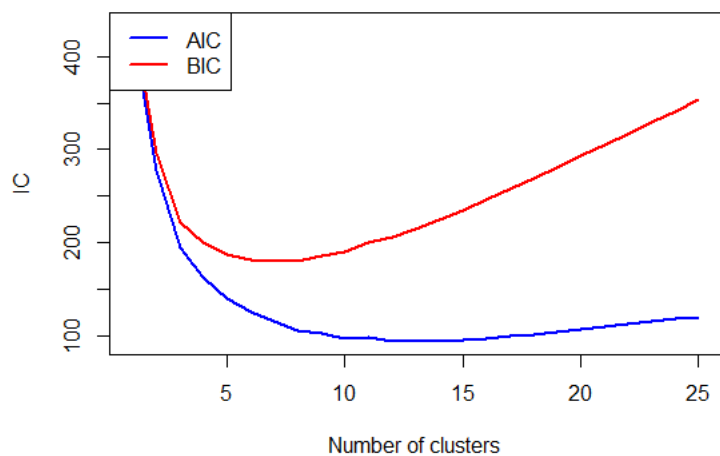[1] **"Transition probabilities: frequentist approach"**
```
                  autocorrelation[, 2]
autocorrelation[, 1]    1    2    3    4    5    6
                   1 0.09 0.27 0.32 0.14 0.00 0.18
                   2 0.03 0.34 0.19 0.22 0.05 0.17
                   3 0.05 0.36 0.23 0.13 0.03 0.20
                   4 0.01 0.26 0.12 0.30 0.08 0.22
                   5 0.13 0.33 0.18 0.21 0.10 0.05
                   6 0.01 0.25 0.12 0.27 0.02 0.33
```
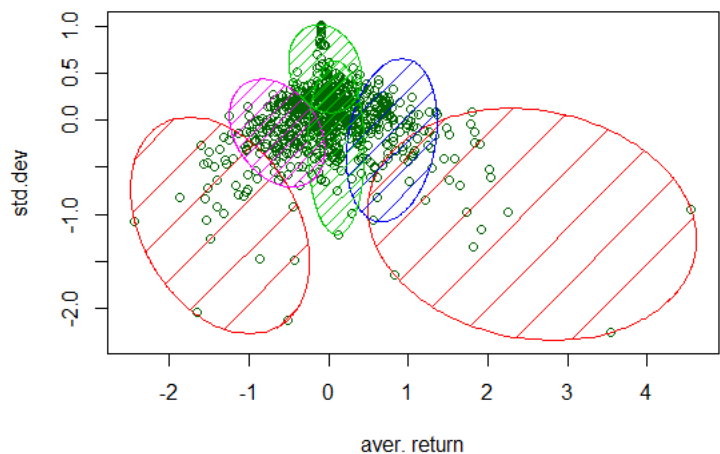
Optimal number of clusters: Elbow method, Model type 2

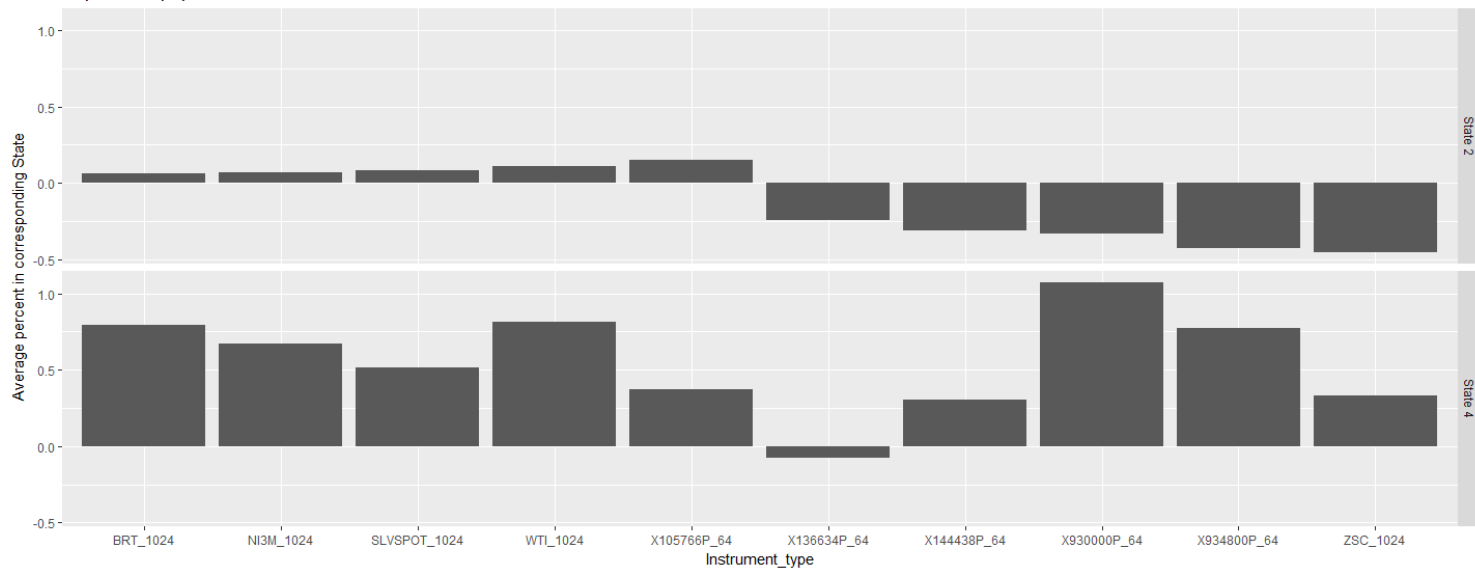## Optimal number of clusters: IC, Model 2

Clusters: Model type 2

These two components explain 100 % of the point variability.

Top 2 most populated clusters in Model

K-MEANS HIERARCHICAL CLUSTERING

```
[1] "----------------------------------------------------------------------"
[1] "Frequency table:"
                 autocorrelation[, 2]
autocorrelation[, 1]    1    2    3    4    5    6
                   1  132   57   68   21    7   12
                   2   71   43   32    9    7    4
                   3   61   36   61    8    8   10
                   4   17   16    5   14    6    2
                   5    8    8   10    2    2    1
                   6    9    6    7    6    1    3
[1] "----------------------------------------------------------------------"
[1] "Transition probabilities: frequentist approach"
                 autocorrelation[, 2]
autocorrelation[, 1]    1     2     3     4     5     6
                   1  0.44  0.19  0.23  0.07  0.02  0.04
                   2  0.43  0.26  0.19  0.05  0.04  0.02
                   3  0.33  0.20  0.33  0.04  0.04  0.05
                   4  0.28  0.27  0.08  0.23  0.10  0.03
                   5  0.26  0.26  0.32  0.06  0.06  0.03
                   6  0.28  0.19  0.22  0.19  0.03  0.09
```
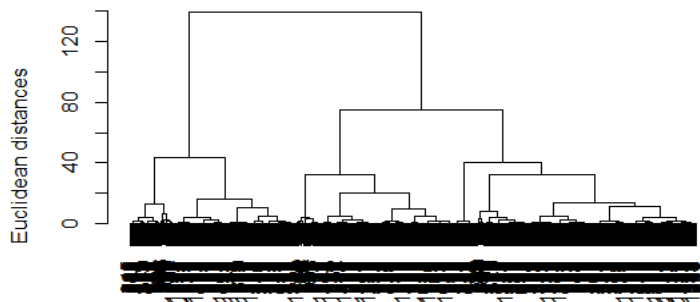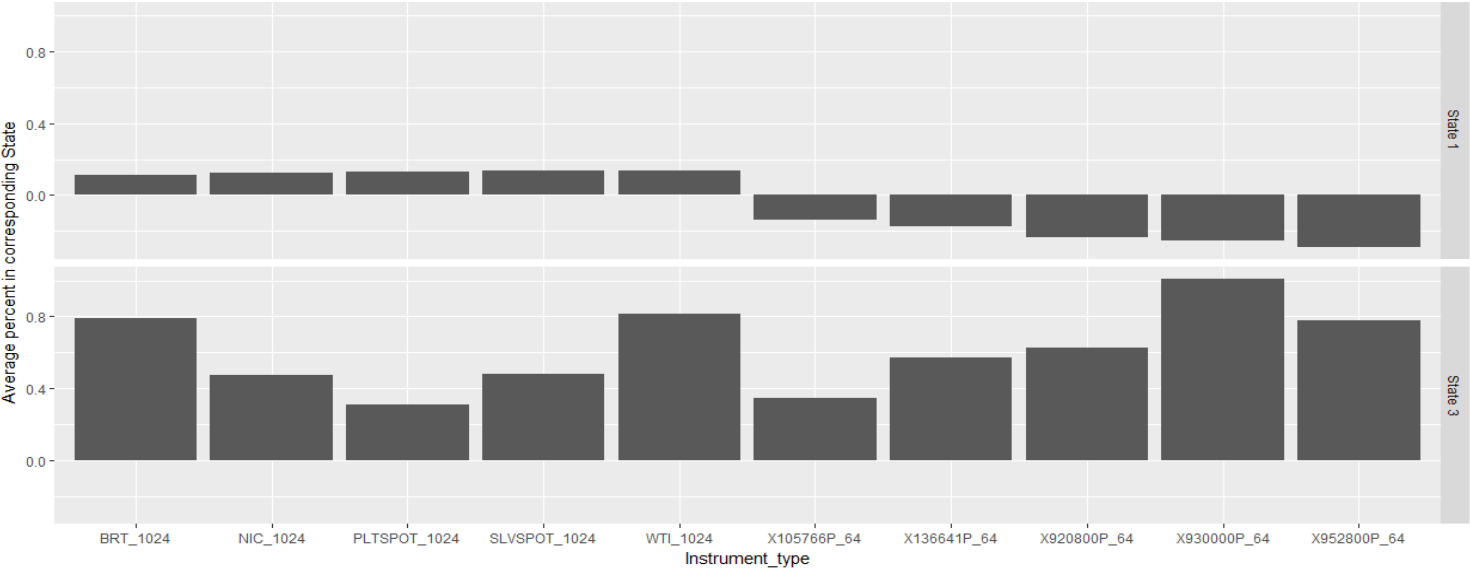
Hierarchical clustering: Model type 2

%
hclust (*, "ward.D")

Top 2 most populated clusters in Model

HIDDEN MARKOV MODEL

```
iteration 0 logLik: -1040.872
iteration 5 logLik: -830.0255
iteration 10 logLik: -724.2916
.................................................................................
iteration 475 logLik: -572.1142
converged at iteration 480 with logLik: -572.1142
Convergence info: Log likelihood converged to within tol. (relative change)
'log Lik.' -572.1142 (df=59)
```

AIC: 1262.228   – with 6 states ICs are pretty high.. I have doubts we can predict global markets with this data
BIC: 1536.518

```
Initial state probabilties model
pr1 pr2 pr3 pr4 pr5 pr6
  0   0   0   1   0   0
```

Transition matrix

	toS1	toS2	toS3	toS4	toS5	toS6
fromS1	0.312	0.000	0.418	0.000	0.244	0.025
fromS2	0.000	0.436	0.000	0.000	0.564	0.000
fromS3	0.000	0.013	0.783	0.043	0.121	0.040
fromS4	0.140	0.000	0.038	0.822	0.000	0.000
fromS5	0.063	0.090	0.133	0.008	0.675	0.032
fromS6	0.000	0.146	0.325	0.107	0.336	0.086

```
Response parameters
Resp 1 : gaussian
Resp 2 : gaussian
```

	Re1.(Intercept)	Re1.sd	Re2.(Intercept)	Re2.sd
St1	0.003	0.056	0.582	0.271
St2	-0.273	1.411	1.815	0.540
St3	-0.075	0.408	0.919	0.161
St4	0.176	0.360	0.785	0.121
St5	0.059	0.705	1.220	0.207
St6	0.000	0.001	0.010	0.019

Hidden Markov Model: Model 2
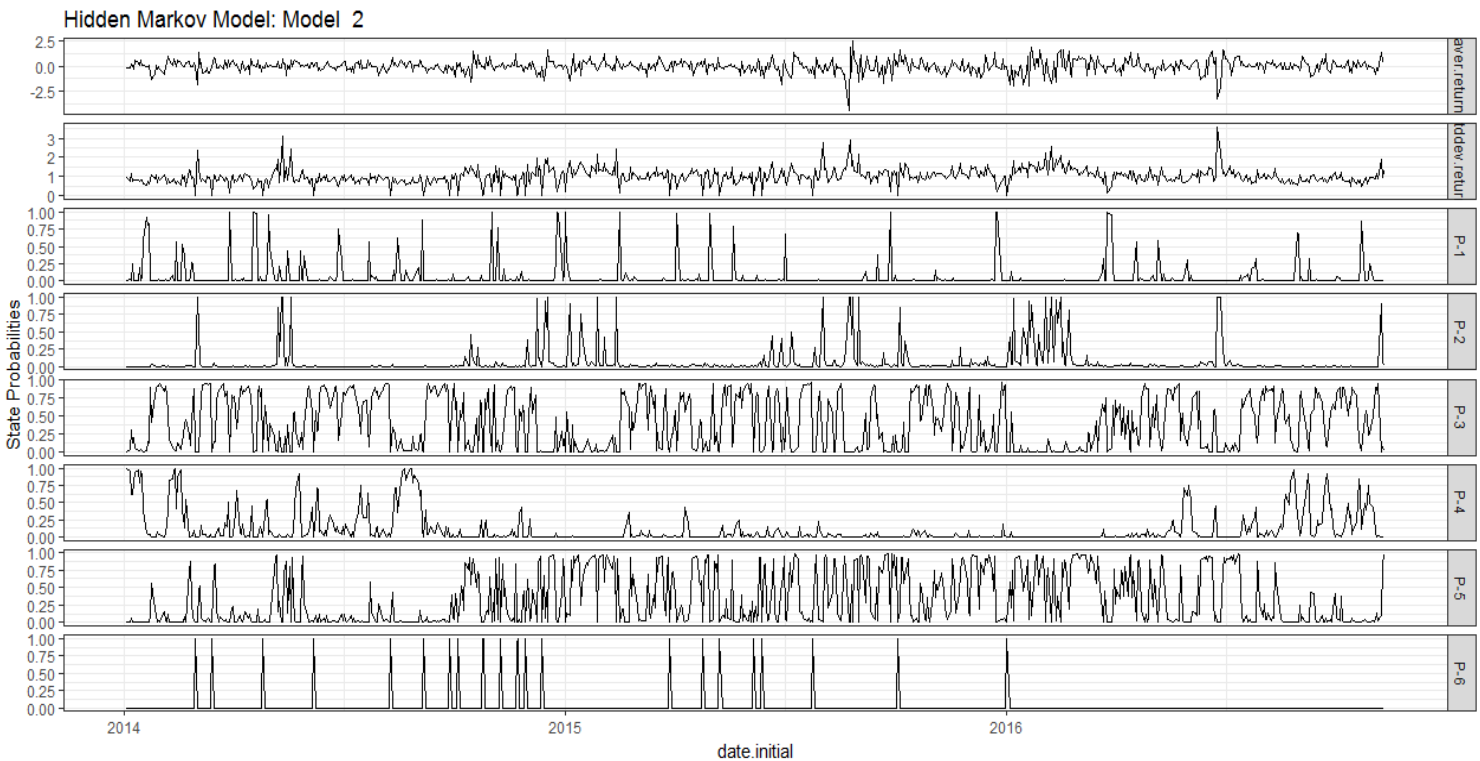
HMM: Returns, Standard deviations and Estimated states, Model 2
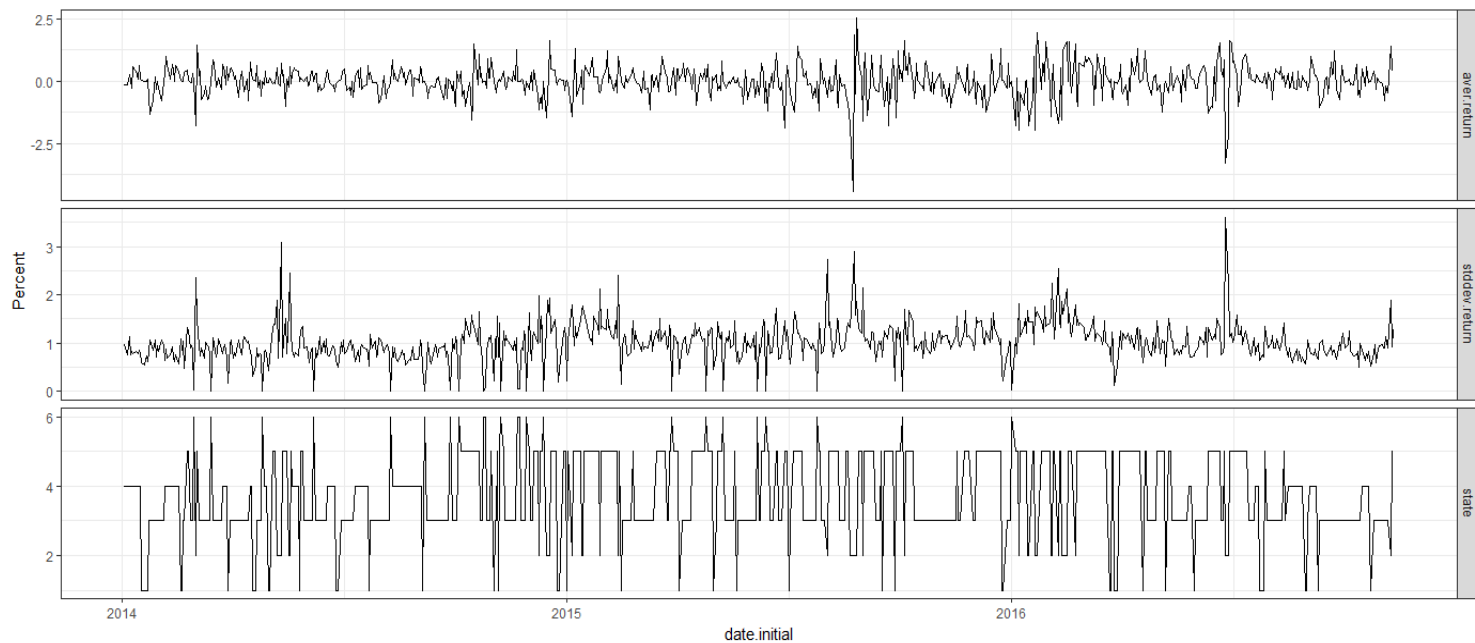
Top 2 most populated clusters in Model
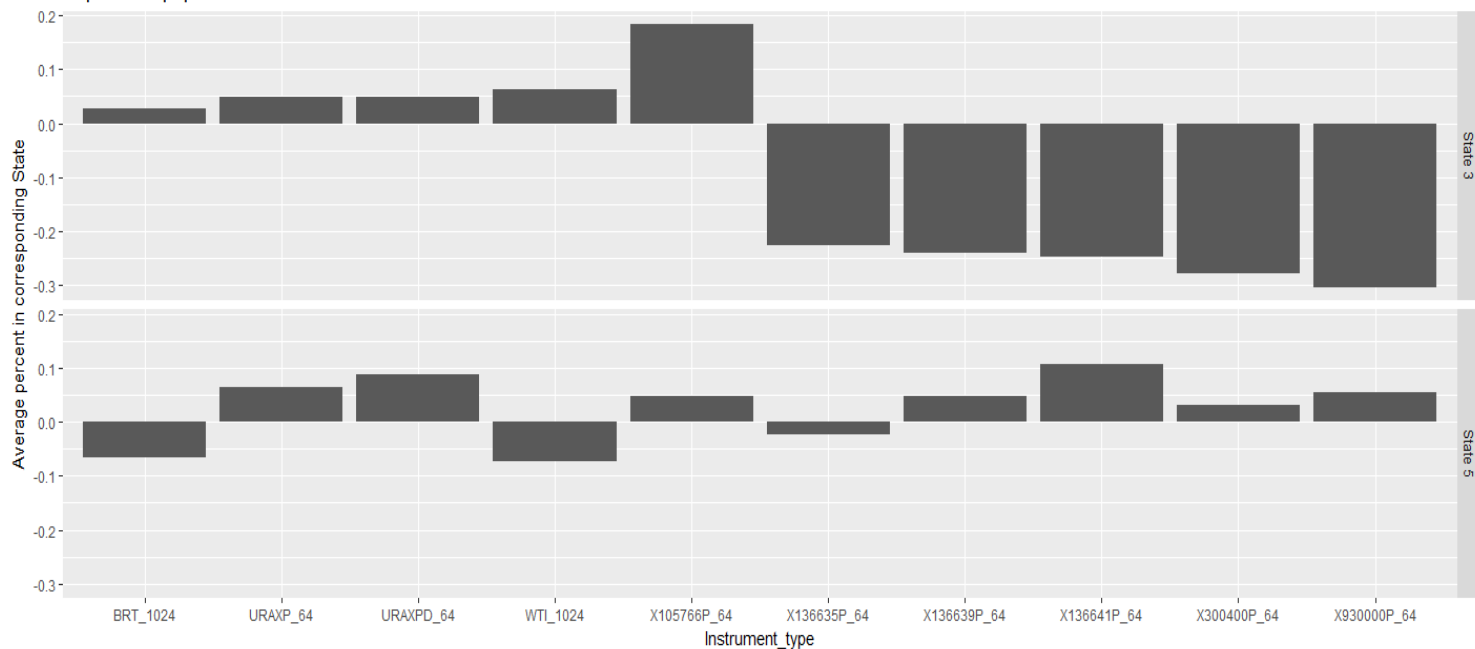
MODEL 3 OUTPUT

K-MEANS CLUSTERING

```
"Cluster size:  "
[1]  48 226 141 161  57 139
[1] "Centers:   "
  aver.return64 stddev.return64 aver.return1024 stddev.return1024
1    -1.7147593       1.3194940     -0.60536794         1.4905898
2    -0.1139629       0.6287933     -0.07559780         0.7023168
3    -0.1881818       0.9084062      0.42596150         1.3672270
4     0.6777029       0.9077502      0.09563086         1.0466392
5     1.0084043       1.1347547      1.14051546         1.8998232
6    -0.2215887       0.8957348     -0.79300919         1.4584619
[1] "----------------------------------------------------------------------"
[1] "Within cluster sum of squares by cluster:   "
[1] 69.74536 74.74442 63.97514 66.62649 85.10181 90.28943
```
between_SS/total_SS=   58.17382 " %"
```
[1] "----------------------------------------------------------------------"
[1] "Frequency table:"
                    autocorrelation[, 2]
autocorrelation[, 1]  1  2  3  4  5  6
                   1  5 18  5  5  1 14
                   2 10 90 35 49  7 35
                   3 11 29 32 27 15 26
                   4  6 43 33 43 11 25
                   5  7  9 11  7 12 11
                   6  9 37 24 29 11 28
[1] "----------------------------------------------------------------------"
```
[1] **"Transition probabilities: frequentist approach"**
```
                    autocorrelation[, 2]
autocorrelation[, 1]    1    2    3    4    5    6
                   1 0.10 0.38 0.10 0.10 0.02 0.29
                   2 0.04 0.40 0.15 0.22 0.03 0.15
                   3 0.08 0.21 0.23 0.19 0.11 0.19
                   4 0.04 0.27 0.20 0.27 0.07 0.16
                   5 0.12 0.16 0.19 0.12 0.21 0.19
                   6 0.07 0.27 0.17 0.21 0.08 0.20
```
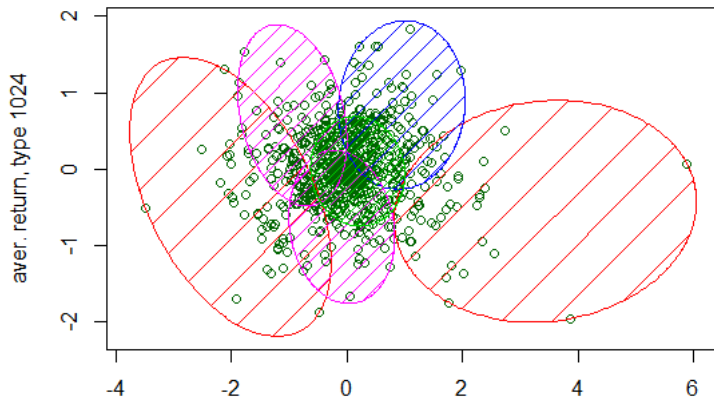

Optimal number of clusters: Elbow method, Model type 3
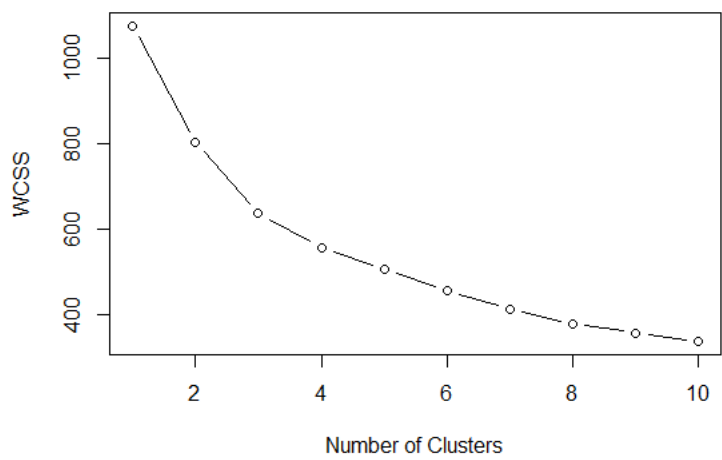
Optimal number of clusters: IC, Model 3
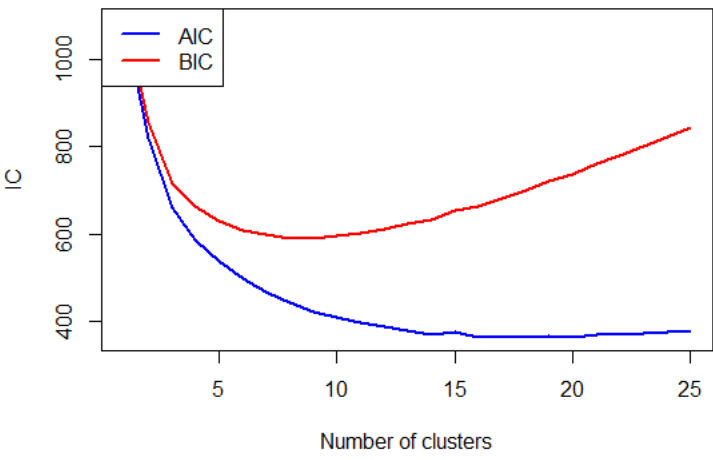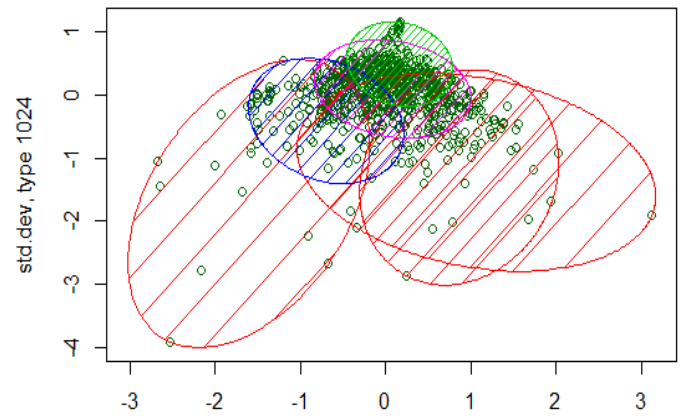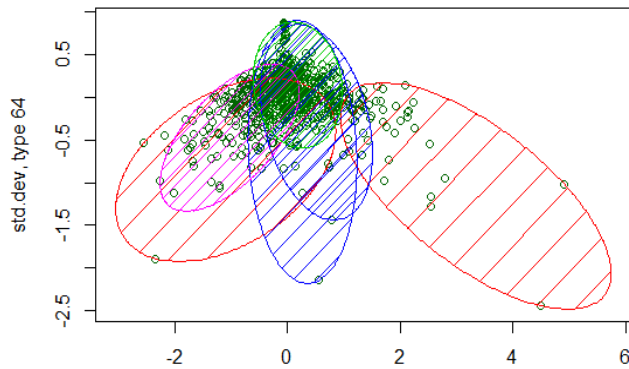
Clusters: Model type 3

aver. return, type 64
These two components explain 100 % of the point variability.
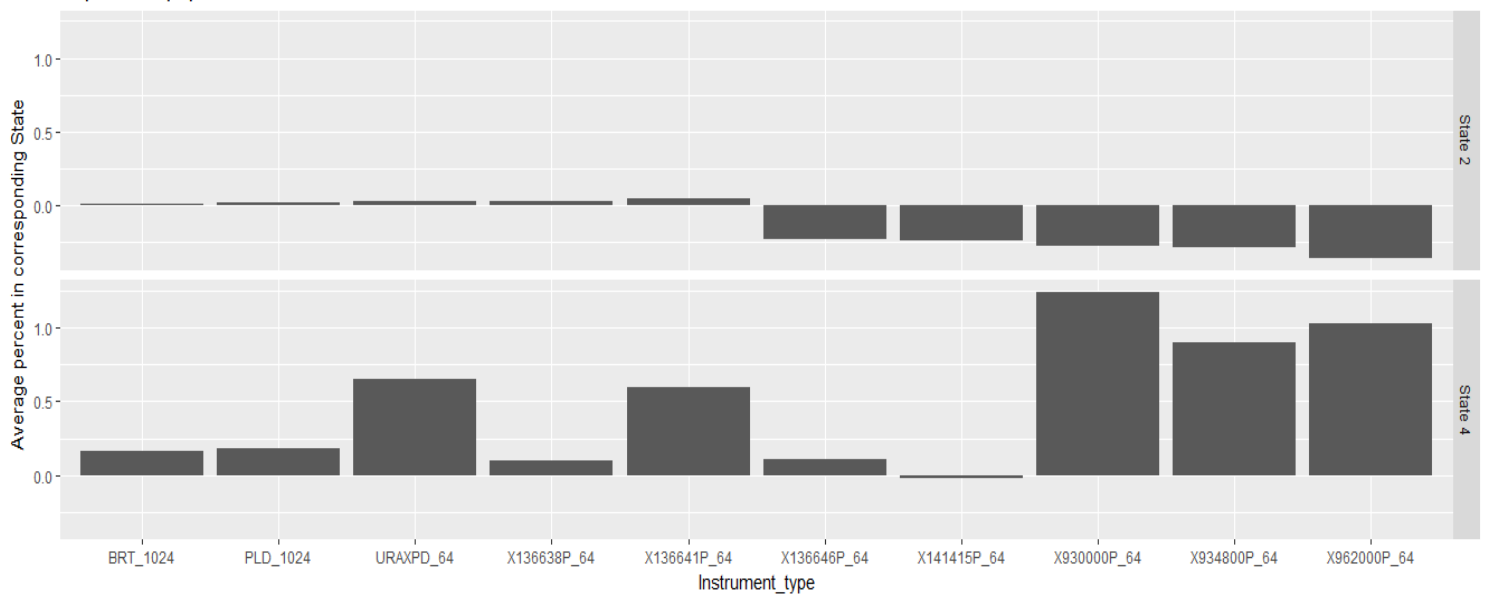
Clusters: Model type 3

aver. return, type 1024
These two components explain 100 % of the point variability.

Clusters: Model type 3

aver. return, type 64
These two components explain 100 % of the point variability.

Top 2 most populated clusters in Model

K-MEANS HIERARCHICAL CLUSTERING

```
"--------------------------------------------------------------------------"
[1] "Frequency table:"
                    autocorrelation[, 2]
autocorrelation[, 1]   1   2   3   4   5   6
                   1  37  54  35  10  14   5
                   2  53  83  56  19  18  11
                   3  32  53  48   7  31   4
                   4  14  20   9  12   6   6
                   5  12  21  20  16  26   5
                   6   8   9   6   3   5   2
[1] "--------------------------------------------------------------------------"
[1] "Transition probabilities: frequentist approach"
                    autocorrelation[, 2]
autocorrelation[, 1]    1     2     3     4     5     6
                   1  0.24  0.35  0.23  0.06  0.09  0.03
                   2  0.22  0.35  0.23  0.08  0.08  0.05
                   3  0.18  0.30  0.27  0.04  0.18  0.02
                   4  0.21  0.30  0.13  0.18  0.09  0.09
                   5  0.12  0.21  0.20  0.16  0.26  0.05
                   6  0.24  0.27  0.18  0.09  0.15  0.06
```


Hierarchical clustering: Model type 3

%
hclust (*, "ward.D")

Top 2 most populated clusters in Model
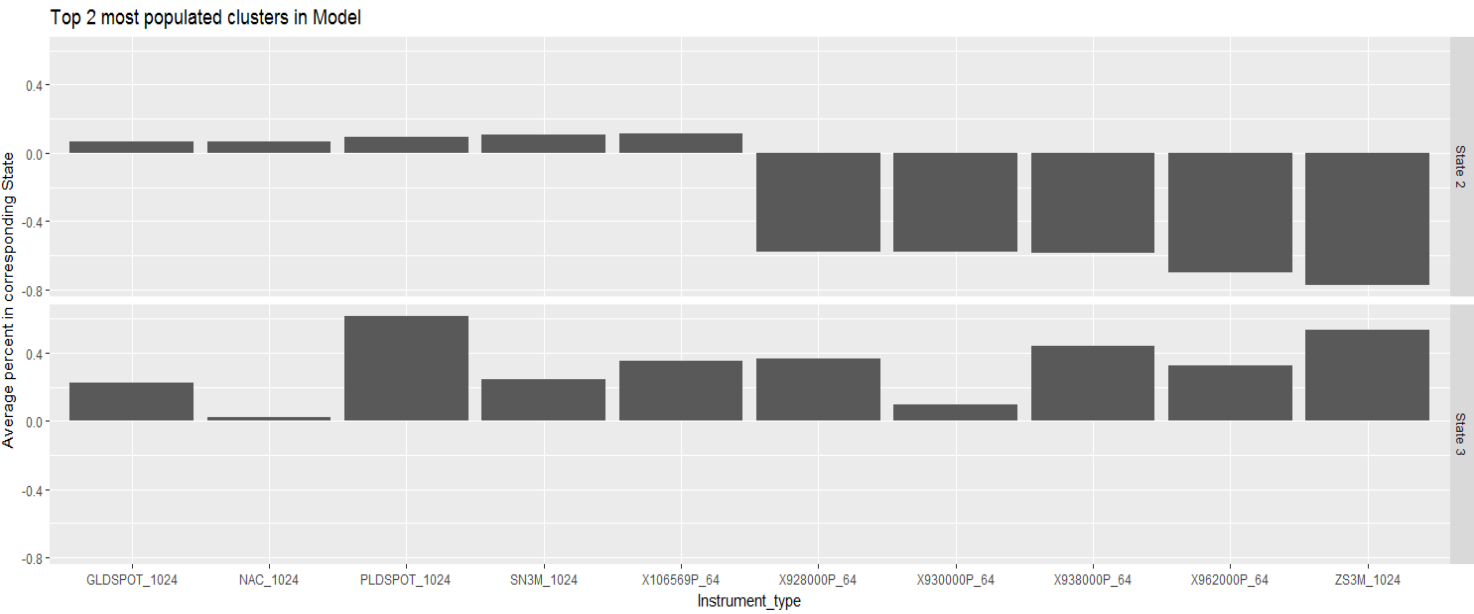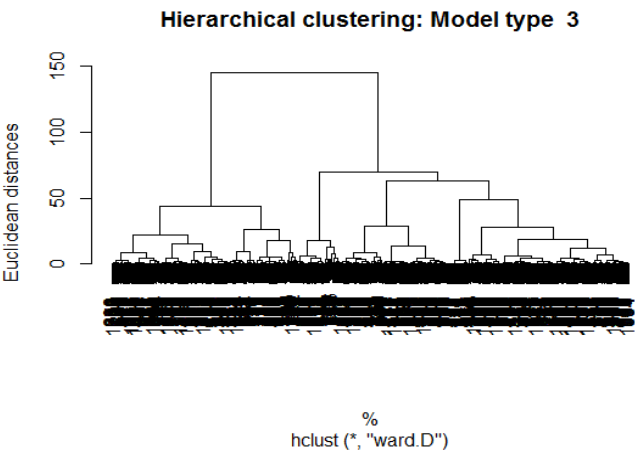
HIDDEN MARKOV MODEL

```
iteration 0 logLik: -2381.483
iteration 5 logLik: -1881.61
iteration 10 logLik: -1749.086
……………………………………………………………………..
iteration 120 logLik: -1588.294
converged at iteration 123 with logLik: -1588.294
Convergence info: Log likelihood converged to within tol. (relative change)
'log Lik.' -1588.294 (df=83)
```

AIC: 3342.587 – and here ICs are even higher...
BIC: 3728.453

```
Initial state probabilties model
pr1 pr2 pr3 pr4 pr5 pr6
  0   0   1   0   0   0
```

Transition matrix

	toS1	toS2	toS3	toS4	toS5	toS6
fromS1	0.526	0.000	0.357	0.046	0.072	0.000
fromS2	0.000	0.565	0.000	0.000	0.414	0.022
fromS3	0.000	0.082	0.560	0.231	0.083	0.043
fromS4	0.008	0.008	0.172	0.730	0.048	0.034
fromS5	0.053	0.119	0.108	0.173	0.500	0.047
fromS6	0.000	0.171	0.253	0.406	0.100	0.069

```
Response parameters
Resp 1 : gaussian
Resp 2 : gaussian
Resp 3 : gaussian
Resp 4 : gaussian
```

	Re1.(Intercept)	Re1.sd	Re2.(Intercept)	Re2.sd	Re3.(Intercept)	Re3.sd	Re4.(Intercept)	Re4.sd
St1	0.128	0.267	0.752	0.424	0.409	0.893	2.169	1.305
St2	-0.358	1.440	1.393	0.483	-0.291	0.940	1.755	0.622
St3	-0.279	0.594	0.873	0.185	-0.441	0.492	1.257	0.302
St4	0.078	0.416	0.735	0.204	0.038	0.359	0.874	0.225
St5	0.420	0.650	0.984	0.201	0.514	0.561	1.375	0.308
St6	0.000	0.002	0.018	0.044	0.009	0.037	0.066	0.118

HMM: Returns, Standard deviations and Estimated states, Model 3
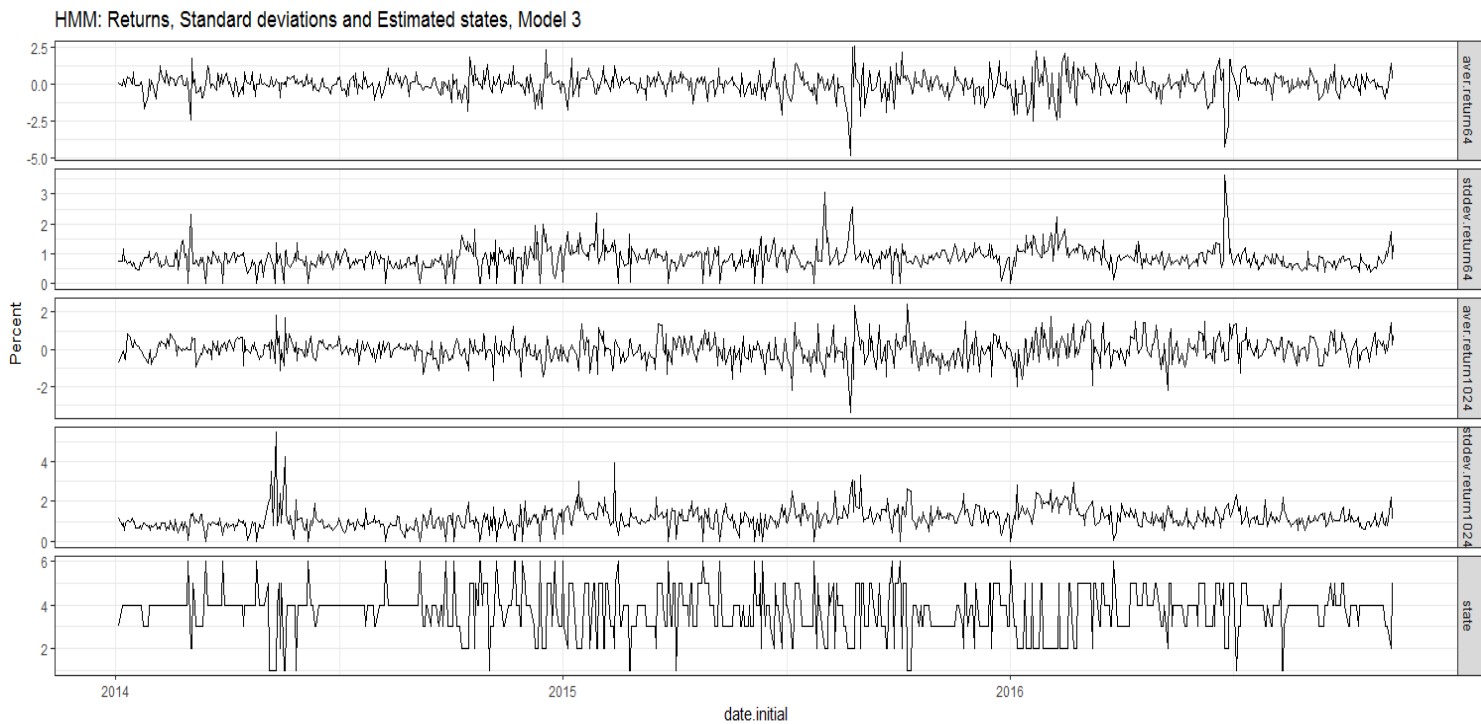
Hidden Markov Model: Model 3
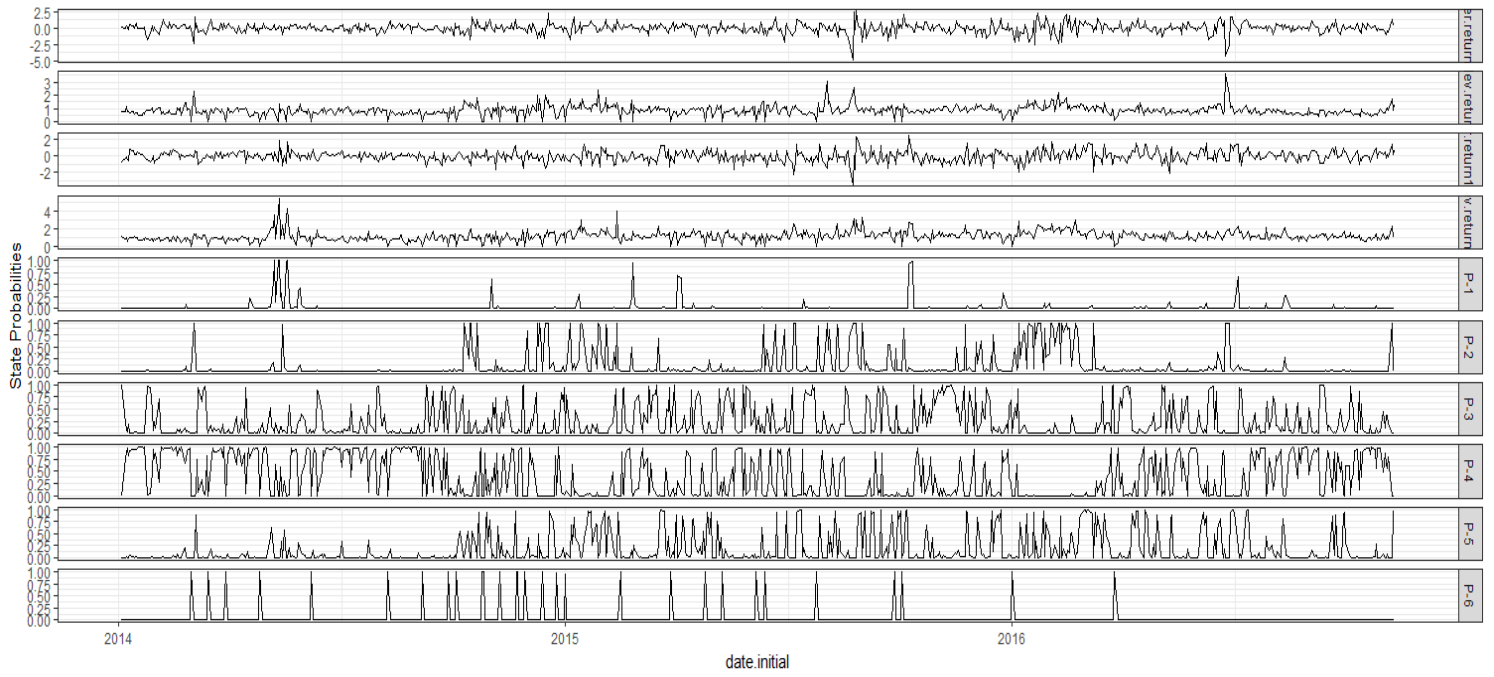
Top 2 most populated clusters in Model
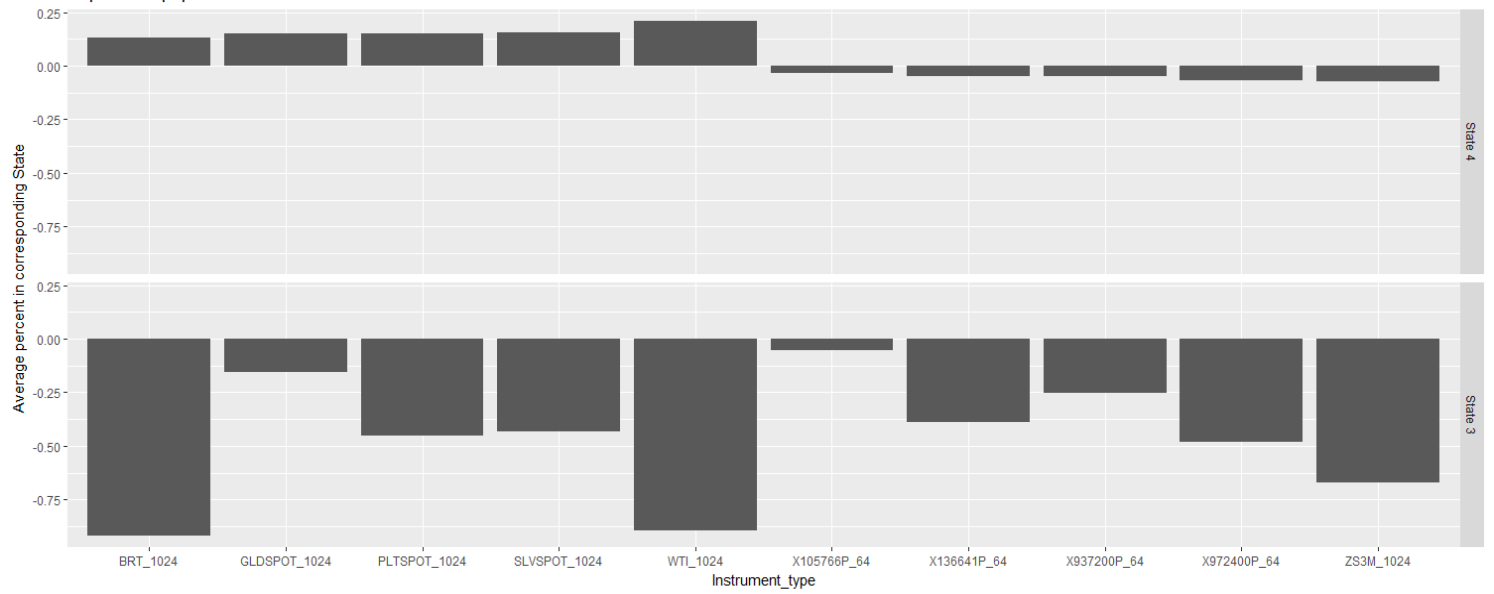
PRINCIPAL COMPONENT ANALYSIS

pca

" Component loadings (used in task2 for ratios calculation:"

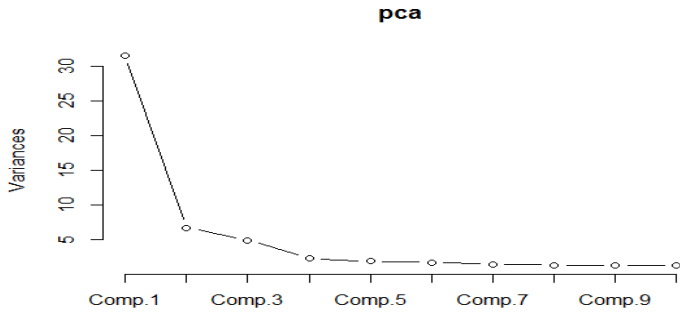| Instr	Comp.1	Comp.2	Comp.3
TW._1	-0.114820410	0.204187267	-0.047621586
LGEN_1	-0.128674726	0.108892282	-0.132577512
MRW_1	-0.085622191	-0.057145315	-0.038227928
CNA_1	-0.100074914	-0.060811021	-0.014956784
CRH_1	-0.120589807	-0.036364122	-0.004524309
SMT_1	-0.028742807	-0.007740891	0.003524123
RB._1	-0.101104103	-0.082027897	0.190869596
MCRO_1	-0.071740960	0.041150184	0.016066781
SN._1	-0.106259783	-0.048359160	0.138056750
RDSA_1	-0.093022162	-0.209930249	-0.091179748
MERL_1	-0.104409978	0.044327975	0.086326596
BLND_1	-0.125326189	0.141401917	-0.023740315
BA._1	-0.110176791	-0.025414768	0.015222708
ADM_1	-0.095342864	0.004069033	0.035829290
NXT_1	-0.093775349	0.108605568	-0.009091832
MNDI_1	-0.123291429	-0.045985088	-0.008980886
RRS_1	0.013479469	-0.220313691	0.005701290
RMG_1	-0.083525437	0.026826196	-0.019650191
AZN_1	-0.083265826	-0.063136695	0.148746779
WTB_1	-0.117077188	0.114644339	0.014199871
EXPN_1	-0.119593103	-0.087856126	0.064178205
SL._1	-0.130406369	0.055370869	-0.120673180
TSCO_1	-0.082679852	-0.063373857	-0.054751425
SBRY_1	-0.033122781	-0.011173041	-0.011798745
ITV_1	-0.115186614	0.158506693	-0.010668224
RSA_1	-0.028216890	-0.008585327	-0.002415960
SGE_1	-0.064093360	0.006628778	0.052319205
CCL_1	-0.100955144	0.042268952	0.085414752
GLEN_1	-0.083705232	-0.169331051	-0.223631371
TUI_1	-0.091692140	0.071096120	0.021304107
UU._1	-0.096687851	-0.058081521	0.168773995
RIO_1	-0.077274217	-0.192959838	-0.235369858
BAB_1	-0.106004592	0.015946564	-0.054597478
HMSO_1	-0.131947185	0.100196160	0.008993490
RBS_1	-0.103463357	0.096246024	-0.176317609
NG._1	-0.085072301	-0.093658188	0.179476949
EZJ_1	-0.086191960	0.162844746	-0.021502644
MDC_1	-0.027985361	-0.080641279	0.088674279
RR._1	-0.074266475	-0.090686617	-0.048301211
SSE_1	-0.107823303	-0.024276095	0.038660500
RDSB_1	-0.090744563	-0.200805375	-0.096585768
LSE_1	-0.122387003	0.062815039	0.008289408
ULVR_1	-0.095832459	-0.109184912	0.188798040
BP._1	-0.095850600	-0.195354313	-0.101110672
HIK_1	-0.064374318	-0.010424843	0.110950906
SHP_1	-0.042679031	0.002252827	0.070061043
STAN_1	-0.098704636	-0.090924765	-0.159623392
SKY_1	-0.093287665	0.033477025	0.064062010
IMB_1	-0.086365475	-0.053402918	0.212830301
DGE_1	-0.097486363	-0.119888517	0.163740259
CTEC_1	-0.006835447	-0.020314228	0.025847514

Instr	Comp.1	Comp.2	Comp.3
ABF_1	-0.102166869	0.044655221	0.061615284
SMIN_1	-0.114750280	-0.090033859	-0.083567103
III_1	-0.137922607	0.028303326	-0.013572876
AAL_1	-0.073091254	-0.189246900	-0.254694467
OML_1	-0.132239130	-0.077613986	-0.057793894
INTU_1	-0.127434804	0.056771222	-0.014153647
IHG_1	-0.114611733	-0.015376556	0.051779465
RTO_1	-0.104806381	-0.024689726	0.047235214
INF_1	-0.109525686	-0.009504443	0.081191244
GKN_1	-0.126479872	-0.025034970	-0.060431862
PRU_1	-0.134737152	0.029622999	-0.114873516
PFG_1	-0.121621597	0.122871962	-0.016811611
WOS_1	-0.126067590	-0.009925726	-0.010522839
VOD_1	-0.109066883	-0.052908201	0.056016638
PSON_1	-0.064278771	-0.076400849	-0.011270609
CCH_1	-0.100464918	-0.055327223	0.073379181
SVT_1	-0.101170399	-0.054738359	0.170635350
BDEV_1	-0.115609184	0.201530764	-0.049875856
AV._1	-0.131694290	0.064709484	-0.108253728
BNZL_1	-0.125277568	-0.068511954	0.121363518
HSBA_1	-0.009834523	0.003023006	-0.013287267
HL._1	-0.119838333	0.069692079	-0.050445457
CPG_1	-0.100029756	-0.080194639	0.171398722
LAND_1	-0.127420503	0.130636076	0.001048100
AHT_1	-0.100506373	-0.020933642	-0.062263511
SDR_1	-0.146492325	0.072306350	-0.067212424
DLG_1	-0.096107853	0.059811800	0.007648071
BARC_1	-0.070364098	0.041650596	-0.113704378
FRES_1	-0.014005327	-0.227453825	-0.048933689
BT.A_1	-0.098583626	0.068557484	0.030925646
SKG_1	-0.020703080	0.013368986	0.015195118
BLT_1	-0.090219778	-0.205403637	-0.220590471
KGF_1	-0.098744068	0.062001286	-0.014160911
IAG_1	-0.115437669	0.163050181	-0.031511854
STJ_1	-0.138883826	0.088966811	-0.060889804
BATS_1	-0.103179374	-0.127266166	0.179327301
DCC_1	-0.099099051	0.022529929	0.062472524
GSK_1	-0.104807472	-0.124640525	0.121639864
CRDA_1	-0.099645658	-0.045916432	0.091989997
BRBY_1	-0.095257313	-0.079806213	-0.006199302
MKS_1	-0.106841488	0.088151200	-0.032495135
ANTO_1	-0.069007327	-0.181497891	-0.239877613
LLOY_1	-0.108081717	0.114579267	-0.147556449
PSN_1	-0.113421852	0.195367506	-0.030070032
WPP_1	-0.025332843	-0.019990641	-0.026047674
REL_1	-0.109304998	-0.070752548	0.178318287
ITRK_1	-0.099275324	-0.094430276	0.028328189
PPB_1	-0.048012695	0.046806106	0.052189925
JMAT_1	-0.118693470	-0.056855849	-0.013244502
WPG_1	-0.081196160	0.075211292	-0.001357304

"Relative contribution of component loadings, %:"

Instrument	Comp.1	Comp.2	Comp.3	Instrument	Comp.1	Comp.2	Comp.3
TW._1	1.2032425	2.52440319	0.63544718	CTEC_1	0.0716310	0.25114838	0.34490094
LGEN_1	1.3484266	1.34625449	1.76907183	ABF_1	1.0706417	0.55208037	0.82217460
MRW_1	0.8972643	0.70649761	0.51010122	SMIN_1	1.2025076	1.11310448	1.11509264
CNA_1	1.0487194	0.75181738	0.19957854	III_1	1.4453383	0.34991901	0.18111210
CRH_1	1.2637020	0.44957605	0.06037093	AAL_1	0.7659483	2.33969280	3.39856134
SMT_1	0.3012057	0.09570200	0.04702477	OML_1	1.3857792	0.95955540	0.77118320
RB._1	1.0595046	1.01412536	2.54690271	INTU_1	1.3354330	0.70187264	0.18886173
MCRO_1	0.7517981	0.50874698	0.21438997	IHG_1	1.2010557	0.19010307	0.69092859
SN._1	1.1135327	0.59787282	1.84218502	RTO_1	1.0983020	0.30524344	0.63029156
RDSA_1	0.9748111	2.59540470	1.21667334	INF_1	1.1477572	0.11750511	1.08338994
MERL_1	1.0941480	0.54803458	1.15191443	GKN_1	1.3254260	0.30951174	0.80638340
BLND_1	1.3133361	1.74817684	0.31678315	PRU_1	1.4119568	0.36623436	1.53283538
BA._1	1.1545804	0.31420726	0.20312694	PFG_1	1.2745144	1.51908773	0.22432874
ADM_1	0.9991306	0.05030617	0.47809456	WOS_1	1.3211055	0.12271350	0.14041339
NXT_1	0.9827041	1.34270979	0.12131849	VOD_1	1.1429493	0.65411342	0.74746806
MNDI_1	1.2920132	0.56852175	0.11983806	PSON_1	0.6735993	0.94455716	0.15039139
RRS_1	0.1412560	2.72377702	0.07607619	CCH_1	1.0528063	0.68402022	0.97914827
RMG_1	0.8752917	0.33165699	0.26220585	SVT_1	1.0601993	0.67673998	2.27690342
AZN_1	0.8725712	0.78057009	1.98482934	BDEV_1	1.2115083	2.49156038	0.66552744
WTB_1	1.2268920	1.41736818	0.18947853	AV._1	1.3800697	0.80001477	1.44450305
EXPN_1	1.2532572	1.08618078	0.85637340	BNZL_1	1.3128266	0.84702537	1.61943589
SL._1	1.3665731	0.68455981	1.61022423	HSBA_1	0.1030593	0.03737396	0.17730103
TSCO_1	0.8664305	0.78350217	0.73058547	HL._1	1.2558270	0.86161547	0.67312801
SBRY_1	0.3471050	0.13813428	0.15743867	CPG_1	1.0482461	0.99146046	2.28708961
ITV_1	1.2070800	1.95964620	0.14235336	LAND_1	1.3352832	1.61507684	0.01398551
RSA_1	0.2956945	0.10614191	0.03223779	AHT_1	1.0532408	0.25880631	0.83082434
SGE_1	0.6716563	0.08195275	0.69813071	SDR_1	1.5351433	0.89393616	0.89686105
CCL_1	1.0579436	0.52257851	1.13974708	DLG_1	1.0071472	0.73946383	0.10205340
GLEN_1	0.8771758	2.09346965	2.98406534	BARC_1	0.7373695	0.51493367	1.51723478
TUI_1	0.9608734	0.87897387	0.28427518	FRES_1	0.1467666	2.81205175	0.65295546
UU._1	1.0132252	0.71807209	2.25206610	BT.A_1	1.0330916	0.84758827	0.41266190
RIO_1	0.8097830	2.38559651	3.14069994	SKG_1	0.2169547	0.16528313	0.20275879
BAB_1	1.1108585	0.19715019	0.72853125	BLT_1	0.9454440	2.53944140	2.94348854
HMSO_1	1.3827198	1.23874280	0.12000625	KGF_1	1.0347730	0.76653283	0.18895866
RBS_1	1.0842280	1.18990656	2.35272566	IAG_1	1.2097109	2.01581815	0.42048409
NG._1	0.8915018	1.15791269	2.39488289	STJ_1	1.4554113	1.09991238	0.81249403
EZJ_1	0.9032351	2.01327832	0.28692439	BATS_1	1.0812521	1.57341405	2.39288603
MDC_1	0.2932682	0.99698236	1.18324116	DCC_1	1.0384930	0.27854149	0.83361333
RR._1	0.7782639	1.12117464	0.64451588	GSK_1	1.0983135	1.54095279	1.62312336
SSE_1	1.1299174	0.30012964	0.51587332	CRDA_1	1.0442210	0.56767295	1.22748503
RDSB_1	0.9509434	2.48259227	1.28880953	BRBY_1	0.9982341	0.98665829	0.08272150
LSE_1	1.2825354	0.77659341	0.11061120	MKS_1	1.1196286	1.08982884	0.43360467
ULVR_1	1.0042612	1.34987232	2.51926054	ANTO_1	0.7231515	2.24389043	3.20084998
BP._1	1.0044513	2.41519982	1.34918840	LLOY_1	1.1326254	1.41656369	1.96894597
HIK_1	0.6746006	0.12888418	1.48049332	PSN_1	1.1885865	2.41536293	0.40124487
SHP_1	0.4472482	0.02785210	0.93487210	WPP_1	0.2654716	0.24714782	0.34757181
STAN_1	1.0343597	1.12411890	2.12996338	REL_1	1.1454446	0.87472623	2.37942207
SKY_1	0.9775934	0.41388236	0.85482292	ITRK_1	1.0403402	1.16745816	0.37800227
IMB_1	0.9050534	0.66022970	2.83993932	PPB_1	0.5031415	0.57867215	0.69640563
DGE_1	1.0215930	1.48220289	2.18489754	JMAT_1	1.2438296	0.70291889	0.17673039
				WPG_1	0.8508824	0.92985047	0.01811143

Instrument	Comp.1	Comp.2	Comp.3	price	dividend	eps	PE.Comp.1	Div.Yield Comp.1	PE.Comp.2	Div.Yield Comp.2	PE.Comp.3	Div.YieldComp.3
TW.	-0.115	0.204	-0.048	198.6	0.1091	0.18	-126.685	-0.000063	225.287	0.000112	-52.542	-0.000026
LGEN	-0.129	0.109	-0.133	250.9	0.1435	0.2211	-146.018	-0.000074	123.569	0.000062	-150.446	-0.000076
MRW	-0.086	-0.057	-0.038	242.1	0.0543	0.1073	-193.189	-0.000019	-128.936	-0.000013	-86.253	-0.000009
CNA	-0.100	-0.061	-0.015	200.9	0.12	0.168	-119.673	-0.000060	-72.720	-0.000036	-17.886	-0.000009
CRH	-0.121	-0.036	-0.005	2773	0.64353	1.52774	-218.882	-0.000028	-66.004	-0.000008	-8.212	-0.000001
SMT	-0.029	-0.008	0.004	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
RB.	-0.101	-0.082	0.191	7572	1.532	3.02	-253.497	-0.000020	-205.667	-0.000017	478.564	0.000039
MCRO	-0.072	0.041	0.016	2408	0.70988	1.41519	-122.070	-0.000021	70.019	0.000012	27.338	0.000005
SN.	-0.106	-0.048	0.138	1312	0.25088	0.66847	-208.555	-0.000020	-94.914	-0.000009	270.963	0.000026
RDSA	-0.093	-0.210	-0.091	2108.5	1.52146	0.74455	-263.431	-0.000067	-594.504	-0.000151	-258.213	-0.000066
MERL	-0.104	0.044	0.086	516.5	0.071	0.207	-260.521	-0.000014	110.606	0.000006	215.399	0.000012
BLND	-0.125	0.141	-0.024	638.5	0.292	0.36979	-216.395	-0.000057	244.152	0.000065	-40.991	-0.000011
BA.	-0.110	-0.025	0.015	635.5	0.213	0.401	-174.607	-0.000037	-40.277	-0.000009	24.125	0.000005
ADM	-0.095	0.004	0.036	2016	1.144	0.785	-244.855	-0.000054	10.450	0.000002	92.015	0.000020
NXT	-0.094	0.109	-0.009	4354	1.58	4.381	-93.197	-0.000034	107.936	0.000039	-9.036	-0.000003
MNDI	-0.123	-0.046	-0.009	1978	0.48655	1.1754	-207.479	-0.000030	-77.385	-0.000011	-15.113	-0.000002
RRS	0.013	-0.220	0.006	7275	0.80929	2.11224	46.426	0.000001	-758.807	-0.000025	19.636	0.000001
RMG	-0.084	0.027	-0.020	433.6	0.23	0.4034	-89.778	-0.000044	28.835	0.000014	-21.121	-0.000010
AZN	-0.083	-0.063	0.149	5140	2.26601	3.48804	-122.701	-0.000037	-93.039	-0.000028	219.194	0.000066
WTB	-0.117	0.115	0.014	4132	0.958	2.4595	-196.692	-0.000027	192.604	0.000027	23.856	0.000003
EXPN	-0.120	-0.088	0.064	1660	0.33666	0.73661	-269.511	-0.000024	-197.990	-0.000018	144.630	0.000013
SL.	-0.130	0.055	-0.121	384.5	0.1982	0.295	-169.970	-0.000067	72.170	0.000029	-157.284	-0.000062
TSCO	-0.083	-0.063	-0.055	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
SBRY	-0.033	-0.011	-0.012	273.2	0.102	0.204	-44.359	-0.000012	-14.963	-0.000004	-15.801	-0.000004
ITV	-0.115	0.159	-0.011	192	0.122	0.17	-130.093	-0.000073	179.019	0.000101	-12.049	-0.000007
RSA	-0.028	-0.009	-0.002	611	0.16	0.395	-43.647	-0.000007	-13.280	-0.000002	-3.737	-0.000001
SGE	-0.064	0.007	0.052	695	0.1415	0.2784	-160.003	-0.000013	16.548	0.000001	130.610	0.000011
CCL	-0.101	0.042	0.085	4723	1.09285	2.79284	-170.726	-0.000023	71.481	0.000010	144.446	0.000020
GLEN	-0.084	-0.169	-0.224	291	0.03237	-0.04047	601.883	-0.000009	1217.577	-0.000019	1608.024	-0.000025
TUI	-0.092	0.071	0.021	1128	0.52813	0.50714	-203.945	-0.000043	158.135	0.000033	47.385	0.000010
UU.	-0.097	-0.058	0.169	1015	0.3895	0.44948	-218.337	-0.000037	-131.158	-0.000022	381.120	0.000065
RIO	-0.077	-0.193	-0.235	3064.014	1.37579	2.29676	-103.088	-0.000035	-257.420	-0.000087	-313.997	-0.000106
BAB	-0.106	0.016	-0.055	922.5	0.27861	0.799	-122.390	-0.000032	18.411	0.000005	-63.037	-0.000016
HMSO	-0.132	0.100	0.009	580	0.24	0.292	-262.087	-0.000055	199.020	0.000041	17.864	0.000004
RBS	-0.103	0.096	-0.176	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
NG.	-0.085	-0.094	0.179	1049.5	0.44207	0.7087	-125.982	-0.000036	-138.697	-0.000039	265.784	0.000076
EZJ	-0.086	0.163	-0.022	1230	0.538	1.076	-98.528	-0.000038	186.152	0.000071	-24.580	-0.000009
MDC	-0.028	-0.081	0.089	871	0.07919	0.31585	-77.173	-0.000003	-222.379	-0.000007	244.532	0.000008
RR.	-0.074	-0.091	-0.048	850.5	0.117	0.3013	-209.637	-0.000010	-255.987	-0.000012	-136.343	-0.000007
SSE	-0.108	-0.024	0.039	1492	0.91302	1.2346	-130.303	-0.000066	-29.337	-0.000015	46.721	0.000024
RDSB	-0.091	-0.201	-0.097	2161	1.52146	0.74455	-263.379	-0.000064	-582.822	-0.000141	-280.333	-0.000068
LSE	-0.122	0.063	0.008	3432	0.4	1.272	-330.214	-0.000014	169.482	0.000007	22.366	0.000001
ULVR	-0.096	-0.109	0.189	4099.5	1.08719	1.60476	-244.812	-0.000025	-278.922	-0.000029	482.301	0.000050
BP.	-0.096	-0.195	-0.101	469	0.32372	0.1116	-402.813	-0.000066	-820.978	-0.000135	-424.919	-0.000070

HIK	-0.064	-0.010	0.111	1700	0.26706	0.95415	-114.695	-0.000010	-18.574	-0.000002	197.680	0.000017
SHP	-0.043	0.002	0.070	4814.5	0.24279	3.53386	-58.146	-0.000002	3.069	0.000000	95.451	0.000004
STAN	-0.099	-0.091	-0.160	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
SKY	-0.093	0.033	0.064	1001	0.335	0.626	-149.171	-0.000031	53.531	0.000011	102.438	0.000021
IMB	-0.086	-0.053	0.213	3644	1.552	2.496	-126.088	-0.000037	-77.965	-0.000023	310.719	0.000091
DGE	-0.097	-0.120	0.164	2290	0.592	0.89	-250.836	-0.000025	-308.477	-0.000031	421.309	0.000042
CTEC	-0.007	-0.020	0.026	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
ABF	-0.102	0.045	0.062	2861	0.3675	1.062	-275.235	-0.000013	120.300	0.000006	165.990	0.000008
SMIN	-0.115	-0.090	-0.084	1629	0.42	0.843	-221.742	-0.000030	-173.980	-0.000023	-161.484	-0.000022
III	-0.138	0.028	-0.014	832.5	0.24	1.2902	-88.994	-0.000040	18.263	0.000008	-8.758	-0.000004
AAL	-0.073	-0.189	-0.255	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000
OML	-0.132	-0.078	-0.058	191.9	0.0606	0.194	-130.808	-0.000042	-76.774	-0.000025	-57.168	-0.000018
INTU	-0.127	0.057	-0.014	267.5	0.14	0.15	-227.259	-0.000067	101.242	0.000030	-25.241	-0.000007
IHG	-0.115	-0.015	0.052	4259	0.76436	1.63768	-298.063	-0.000021	-39.989	-0.000003	134.659	0.000009
RTO	-0.105	-0.025	0.047	258.1	0.0337	0.1063	-254.473	-0.000014	-59.947	-0.000003	114.689	0.000006
INF	-0.110	-0.010	0.081	644	0.193	0.421	-167.540	-0.000033	-14.539	-0.000003	124.198	0.000024
GKN	-0.126	-0.025	-0.060	350.2	0.0885	0.31	-142.881	-0.000032	-28.281	-0.000006	-68.269	-0.000015
PRU	-0.135	0.030	-0.115	1748.5	0.435	1.313	-179.427	-0.000034	39.448	0.000007	-152.975	-0.000029
PFG	-0.122	0.123	-0.017	3078	1.346	1.757	-213.063	-0.000053	215.253	0.000054	-29.451	-0.000007
WOS	-0.126	-0.010	-0.011	4835	1	2.462	-247.578	-0.000026	-19.493	-0.000002	-20.665	-0.000002
VOD	-0.109	-0.053	0.056	220.15	0.12605	0.05457	-440.005	-0.000062	-213.446	-0.000030	225.986	0.000032
PSON	-0.064	-0.076	-0.011	695.5	0.52	0.588	-76.030	-0.000048	-90.369	-0.000057	-13.331	-0.000008
CCH	-0.100	-0.055	0.073	2209	0.37558	0.8297	-267.479	-0.000017	-147.304	-0.000009	195.365	0.000012
SVT	-0.101	-0.055	0.171	2402	0.815	1.06746	-227.654	-0.000034	-123.172	-0.000019	383.964	0.000058
BDEV	-0.116	0.202	-0.050	612	0.307	0.543	-130.300	-0.000058	227.140	0.000101	-56.214	-0.000025
AV.	-0.132	0.065	-0.108	528	0.233	0.511	-136.076	-0.000058	66.862	0.000029	-111.855	-0.000048
BNZL	-0.125	-0.069	0.121	2442	0.42	1.048	-291.916	-0.000022	-159.643	-0.000012	282.796	0.000021
HSBA	-0.010	0.003	-0.013	664.2	0.41274	0.50176	-13.018	-0.000006	4.002	0.000002	-17.589	-0.000008
HL.	-0.120	0.070	-0.050	1355	0.34	0.373	-435.338	-0.000030	253.171	0.000017	-183.254	-0.000013
CPG	-0.100	-0.080	0.171	1601	0.317	0.61	-262.537	-0.000020	-210.478	-0.000016	449.851	0.000034
LAND	-0.127	0.131	0.001	1092	0.3628	0.47535	-292.717	-0.000042	300.104	0.000043	2.408	0.000000
AHT	-0.101	-0.021	-0.062	1542	0.261	1.04325	-148.556	-0.000017	-30.941	-0.000004	-92.030	-0.000011
SDR	-0.146	0.072	-0.067	3125	0.93	1.824	-250.981	-0.000044	123.880	0.000022	-115.153	-0.000020
DLG	-0.096	0.060	0.008	350.5	0.246	0.202	-166.761	-0.000067	103.782	0.000042	13.271	0.000005
BARC	-0.070	0.042	-0.114	208.351	0.03	0.13125	-111.699	-0.000010	66.118	0.000006	-180.498	-0.000016
FRES	-0.014	-0.227	-0.049	1581	0.24279	0.36661	-60.398	-0.000002	-980.891	-0.000035	-211.026	-0.000008
BT.A	-0.099	0.069	0.031	308.95	0.154	0.289	-105.389	-0.000049	73.290	0.000034	33.060	0.000015
SKG	-0.021	0.013	0.015	2099	0.796	1.87499	-23.177	-0.000008	14.966	0.000005	17.011	0.000006
BLT	-0.090	-0.205	-0.221	1194.5	0.23138	0.17608	-612.037	-0.000017	-1393.427	-0.000040	-1496.452	-0.000043
KGF	-0.099	0.062	-0.014	367.8	0.104	0.244	-148.845	-0.000028	93.459	0.000018	-21.346	-0.000004
IAG	-0.115	0.163	-0.032	590.5	0.2006	0.76995	-88.533	-0.000039	125.049	0.000055	-24.167	-0.000011
STJ	-0.139	0.089	-0.061	1168	0.33	0.379	-428.011	-0.000039	274.177	0.000025	-187.650	-0.000017
BATS	-0.103	-0.127	0.179	5386	1.694	2.475	-224.535	-0.000032	-276.952	-0.000040	390.245	0.000056
DCC	-0.099	0.023	0.062	7535	1.1	2.97455	-251.033	-0.000014	57.072	0.000003	158.253	0.000009
GSK	-0.105	-0.125	0.122	1638	0.8	1.024	-167.651	-0.000051	-199.376	-0.000061	194.576	0.000059
CRDA	-0.100	-0.046	0.092	3929	0.74	1.55	-252.586	-0.000019	-116.391	-0.000009	233.180	0.000017
BRBY	-0.095	-0.080	-0.006	1718	0.38	0.7743	-211.355	-0.000021	-177.072	-0.000018	-13.755	-0.000001
MKS	-0.107	0.088	-0.032	382.6	0.187	0.29292	-139.552	-0.000052	115.139	0.000043	-42.444	-0.000016
ANTO	-0.069	-0.181	-0.240	806	0.14567	0.28082	-198.062	-0.000012	-520.929	-0.000033	-688.489	-0.000043

LLOY	-0.108	0.115	-0.148	71.28	0.0305	0.07204	-106.941	-0.000046	113.370	0.000049	-146.000	-0.000063
PSN	-0.113	0.195	-0.030	2422	1.1	1.995	-137.698	-0.000052	237.183	0.000089	-36.506	-0.000014
WPP	-0.025	-0.020	-0.026	1698	0.566	1.132	-37.999	-0.000008	-29.986	-0.000007	-39.072	-0.000009
REL	-0.109	-0.071	0.178	1613	0.3595	0.722	-244.195	-0.000024	-158.066	-0.000016	398.376	0.000040
ITRK	-0.099	-0.094	0.028	4140	0.624	1.677	-245.080	-0.000015	-233.119	-0.000014	69.934	0.000004
PPB	-0.048	0.047	0.052	8360	1.65	3.333	-120.428	-0.000009	117.401	0.000009	130.905	0.000010
JMAT	-0.119	-0.057	-0.013	3080	0.78373	2.0369	-179.477	-0.000030	-85.972	-0.000014	-20.027	-0.000003
WPG	-0.081	0.075	-0.001	0	0	0	0.000	0.000000	0.000	0.000000	0.000	0.000000

	Comp.1	Comp.2	Comp.3	Average
PE ratio	-16770.96022	-4723.01610	3440.42311	**-6017.85107**
Dividend yield	-0.00308	-0.00004	-0.00001	**-0.00308**