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Assignment 4#

Problem 1

This first step is standardizing the variables. Please be advised that Sigma for y (standard space) is unit. The sigma reported here is before standardization.

Table 1 Loading between PCs and variables

		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
	Sigma	1.781	1.647	0.944	0.878	0.836	0.773	0.683	0.554	0.461	0.412
y1	1.209	0.324	-0.201	0.308	0.058	-0.515	0.662	-0.217	0.020	-0.031	0.066
y2	1.188	-0.232	-0.254	-0.129	0.804	0.359	0.267	-0.120	0.020	0.050	0.016
y3	1.828	-0.404	-0.273	-0.035	-0.118	-0.217	0.103	0.447	0.594	0.340	0.145
y4	2.242	-0.468	-0.220	0.012	-0.112	-0.113	0.091	0.095	-0.065	-0.810	-0.170
y5	1.349	0.150	0.427	-0.008	-0.063	0.353	0.542	0.596	-0.057	-0.090	-0.085
y6	0.979	0.071	-0.310	0.735	-0.190	0.535	-0.061	-0.054	0.169	-0.021	-0.001
y7	2.268	-0.332	0.402	0.099	-0.083	0.007	0.178	-0.414	0.286	0.175	-0.629
y8	1.036	0.111	-0.340	-0.555	-0.478	0.358	0.310	-0.319	0.088	0.017	0.046
y9	1.849	-0.470	-0.119	0.141	-0.209	-0.013	0.181	0.026	-0.707	0.406	0.048
y10	2.636	-0.297	0.450	0.095	-0.060	0.081	0.120	-0.312	0.145	-0.141	0.733

Table 2 correlation between PCs and variables

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	
y1	0.577	-0.331	0.291	0.051	0.431	0.512	0.148	0.011	-0.014	0.027	
y2	-0.413	-0.419	-0.122	0.707	-0.300	0.206	0.082	0.011	0.023	0.007	
y3	-0.719	-0.450	-0.033	-0.104	0.181	0.080	-0.306	0.329	0.157	0.060	
y4	-0.834	-0.362	0.011	-0.099	0.094	0.070	-0.065	-0.036	-0.374	-0.070	
y5	0.266	0.703	-0.008	-0.055	-0.295	0.419	-0.407	-0.032	-0.041	-0.035	
y6	0.126	-0.511	0.695	-0.167	-0.447	-0.047	0.037	0.093	-0.010	0.000	
y7	-0.591	0.663	0.093	-0.073	-0.006	0.137	0.283	0.158	0.081	-0.259	
y8	0.198	-0.559	-0.524	-0.420	-0.299	0.239	0.218	0.049	0.008	0.019	
y9	-0.838	-0.196	0.133	-0.184	0.011	0.140	-0.018	-0.391	0.187	0.020	
y10	-0.528	0.741	0.090	-0.053	-0.068	0.093	0.213	0.080	-0.065	0.302	

Table 3 location of 6 samples points in PCs

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
1	1.802	-0.399	-1.537	-0.700	-0.411	-1.164	0.123	0.105	0.345	0.175
2	1.265	-0.557	-0.223	-0.201	-1.061	0.294	0.504	0.322	-0.472	0.274
3	1.783	2.145	-2.078	1.404	1.487	-0.196	0.294	0.096	-0.887	-0.668
4	0.006	3.060	-0.100	0.713	-0.429	-0.893	0.573	0.127	-0.152	0.280
5	-2.785	-0.975	0.227	0.729	-0.981	-0.045	0.921	-0.542	0.080	-0.409
6	-1.976	2.334	-1.557	-1.301	-1.654	1.100	-1.126	0.478	0.147	0.420

Table 4 location of 6 samples points in original space

	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10
1	-0.518	-1.339	-0.405	-2.352	-0.786	-0.941	-2.612	1.114	-1.785	-2.552
2	1.348	-0.779	0.477	0.155	0.090	-0.472	-2.257	0.217	-1.501	-1.485
3	-1.672	0.994	-3.510	-1.816	2.496	-1.544	0.175	0.381	-3.985	-0.593
4	-1.291	-0.771	-1.036	-1.474	1.304	-1.380	1.305	-1.905	-1.435	3.197
5	-0.430	1.150	2.913	3.772	-0.848	-0.588	0.444	-1.141	3.258	-1.133
6	0.239	-1.328	1.390	1.138	0.102	-2.592	4.713	0.748	1.239	5.900

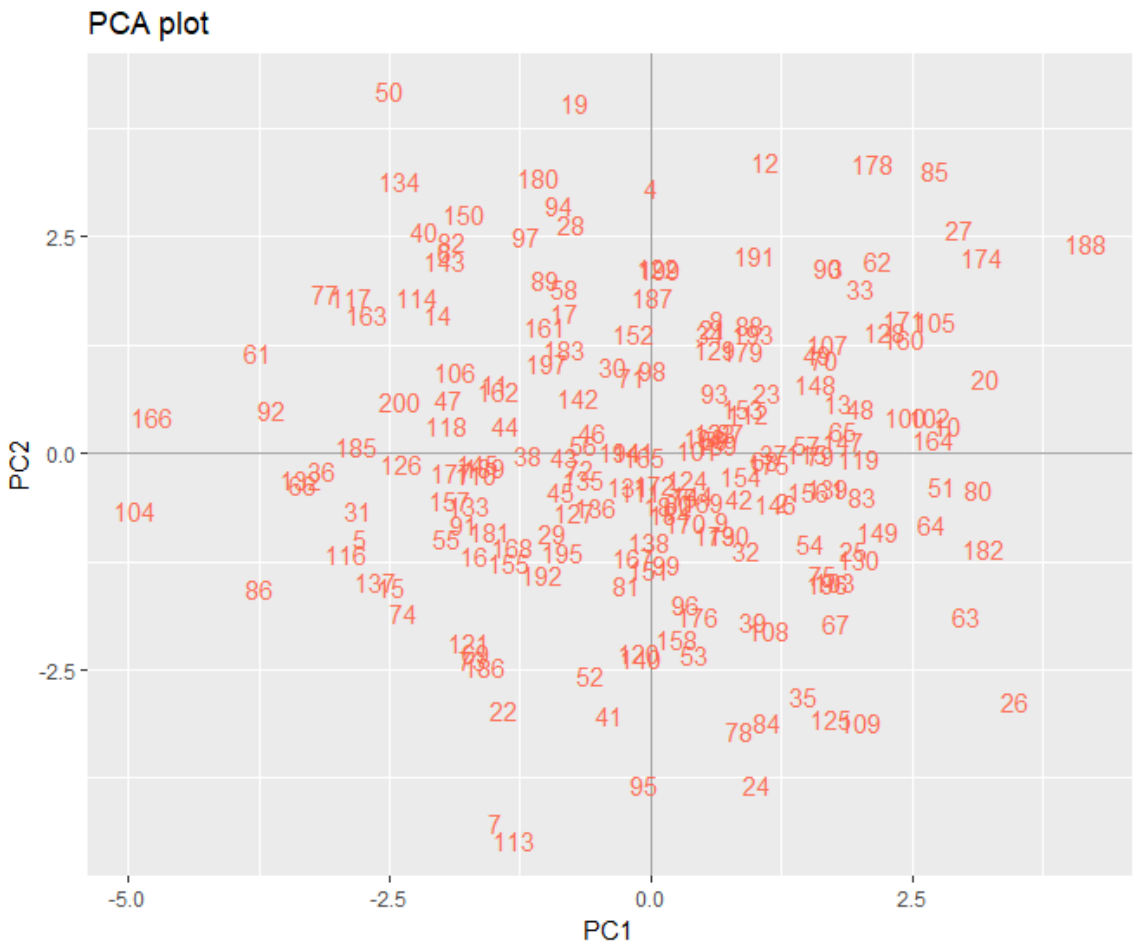


Figure 1 Scores inPC1 and PC2

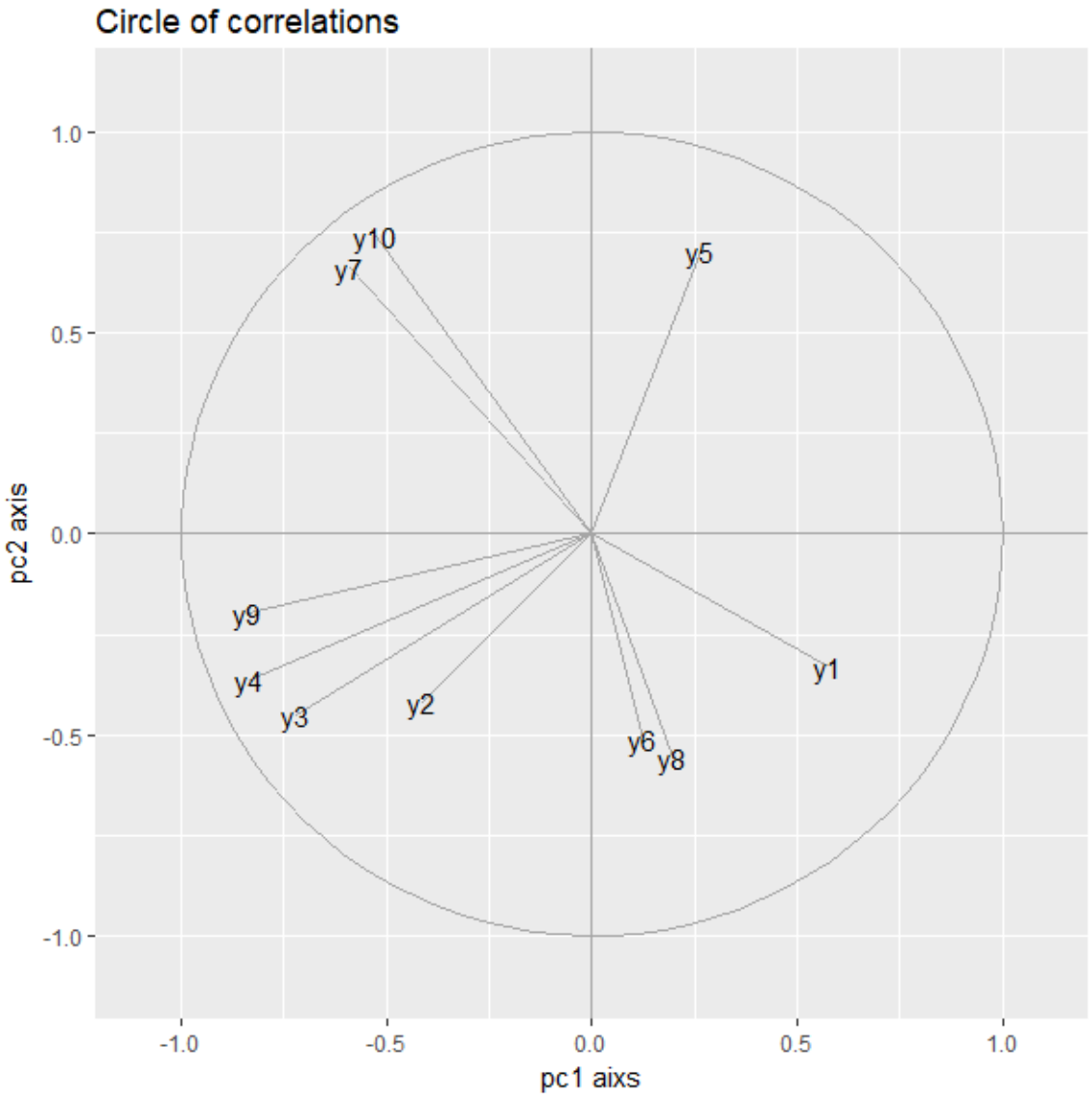


Figure 2 Importance each random variable in 2D space of pc1 and pc2

The following table shows the contribution of each of the principal components in total variation in percentage and their cumulative values. Although usually 90% or 95% is a desirable value yet here for accentuating the difference we choose just first 2 components.

Table 5Percentage contribution and cumulative contribution of each PC

	%	%
PC1	**31.71069**	**31.71069**
PC2	**27.13716**	**58.84785**
PC3	8.918701	67.76655
PC4	7.712852	75.4794
PC5	6.989312	82.46871
PC6	5.977137	88.44585
PC7	4.663482	93.10933
PC8	3.064174	96.17351
PC9	2.127433	98.30094
PC10	1.699059	100

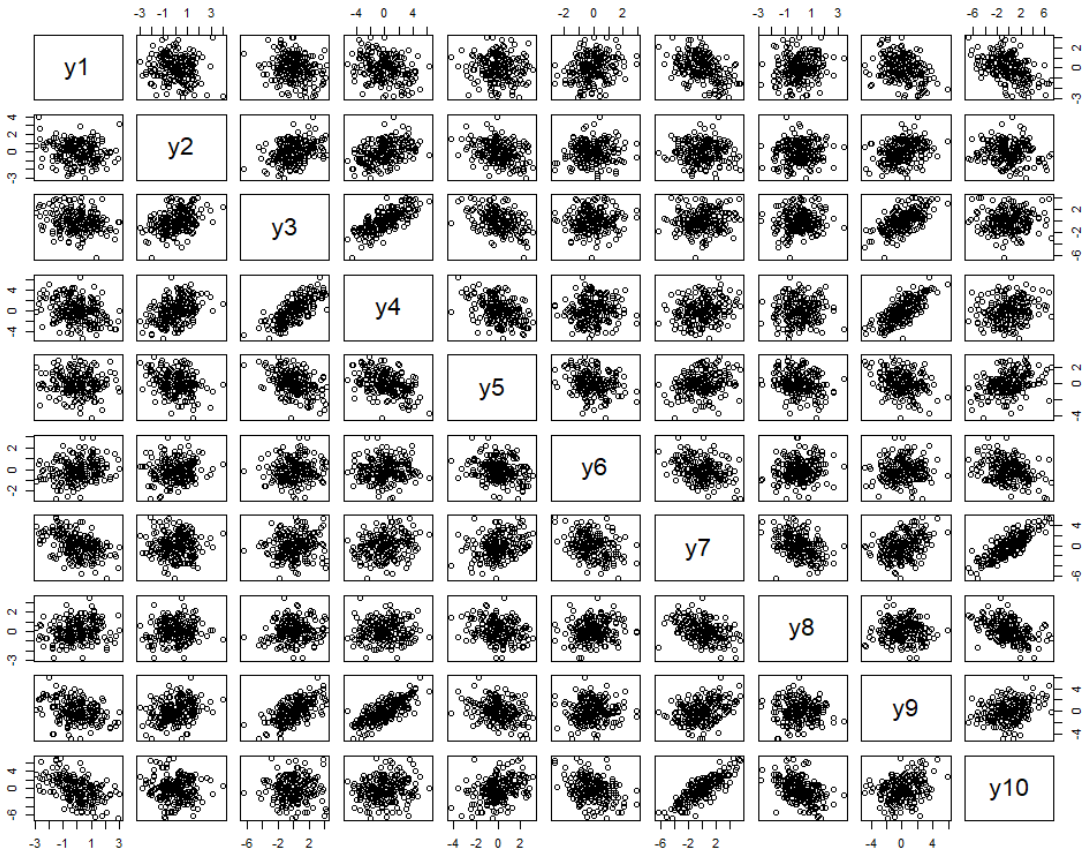


Figure 32by2 scatter diagram for the original space

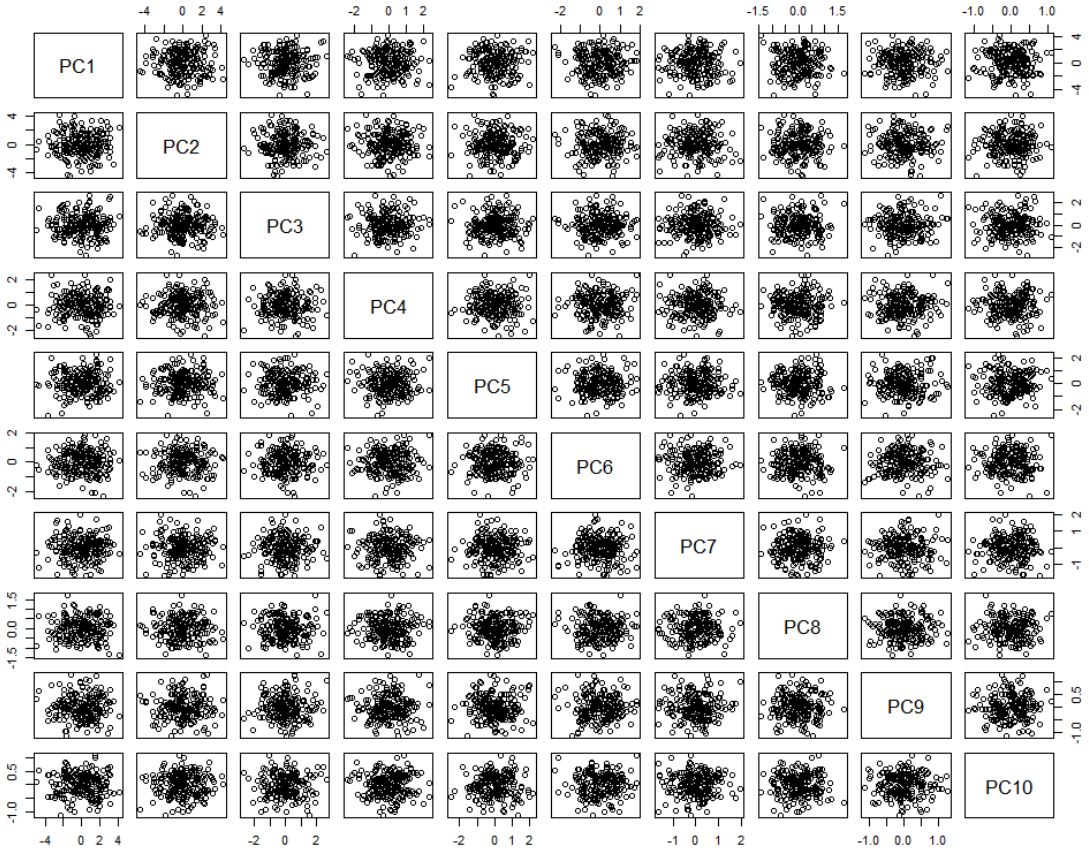


Figure 4 2by2 scatter diagram for the rotated space

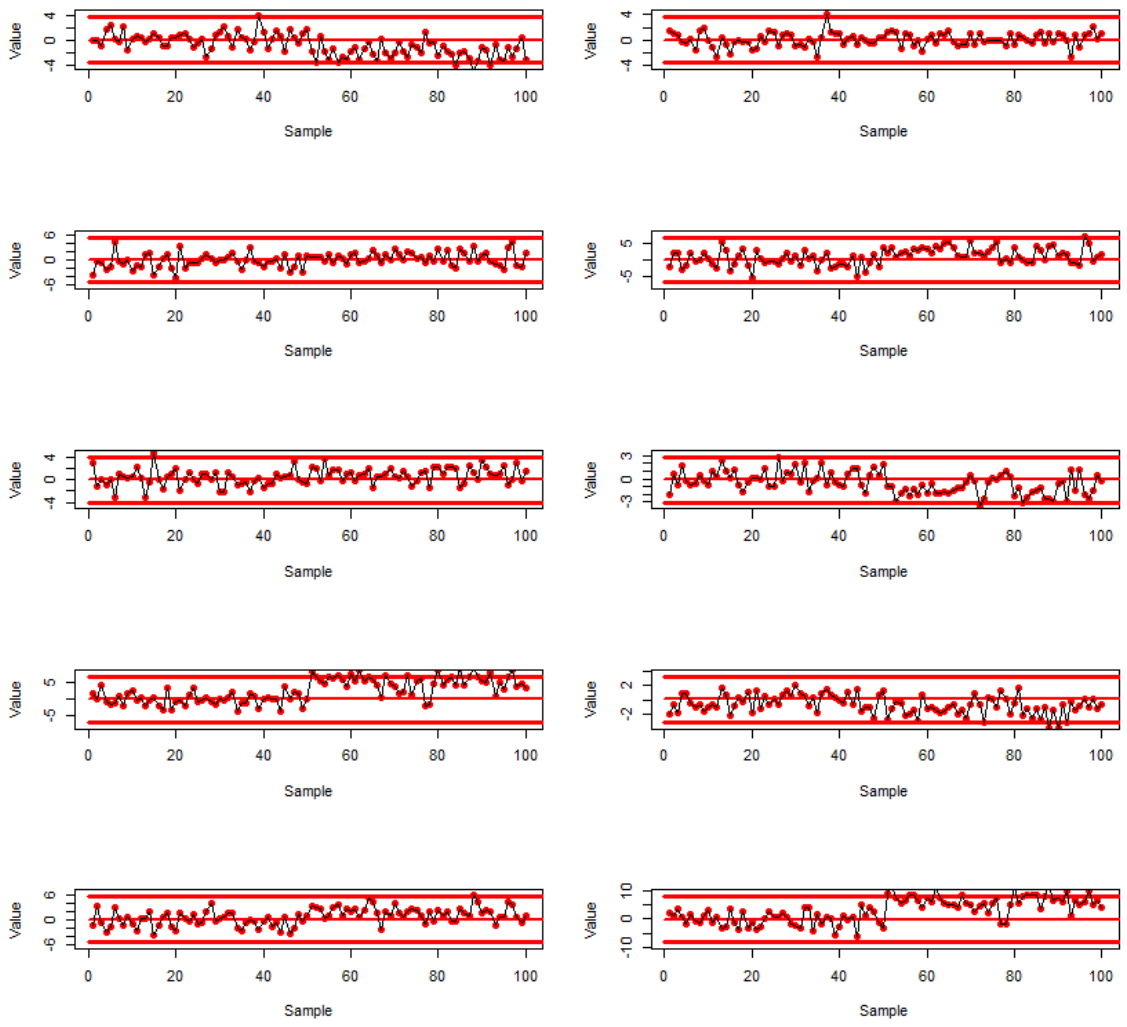


Figure 5 X Chart based on first 200 data for the remaining 100 ones in original space

Although X chart is drown for all PCs but we just consider the first two.

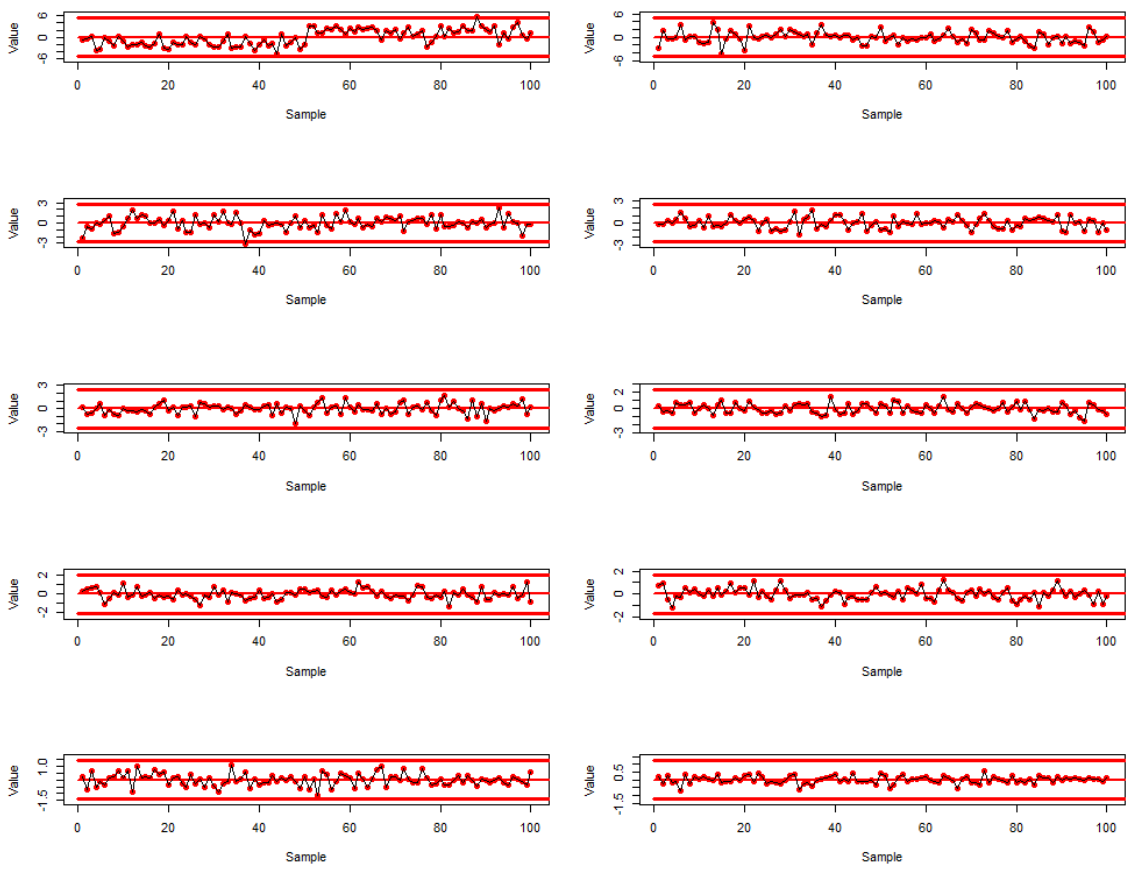
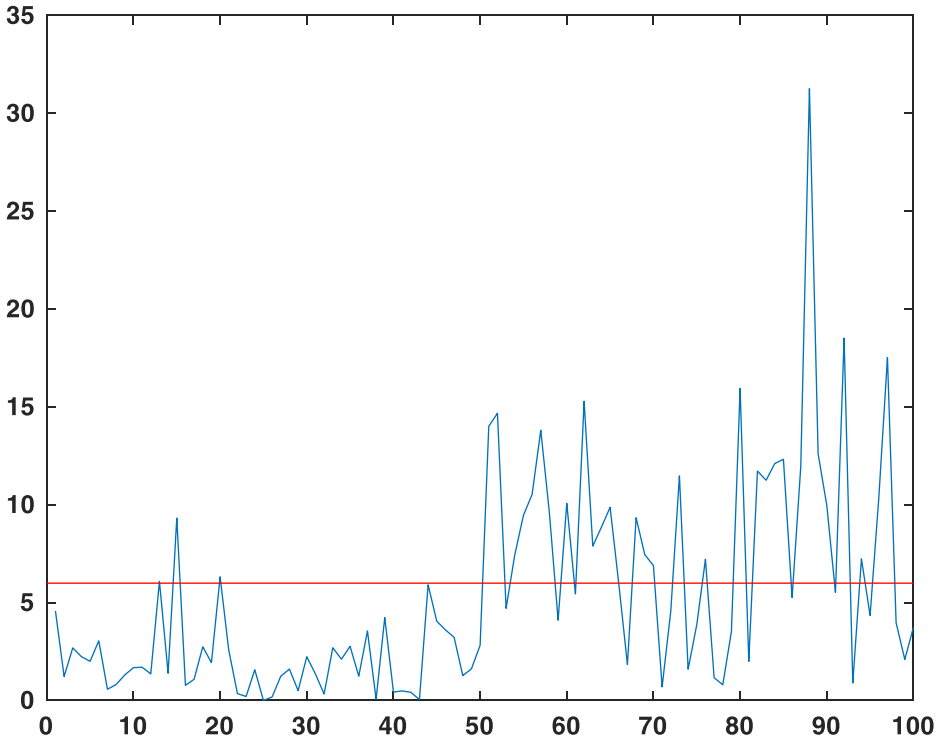
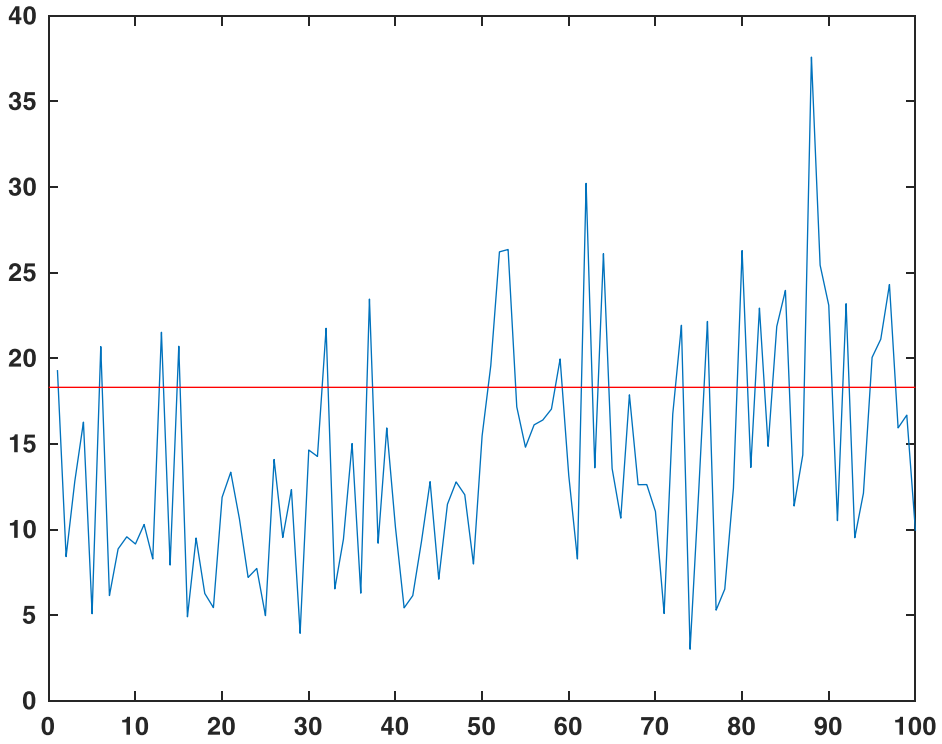


Figure 6 X Chart based on first 200 data for the remaining 100 ones in rotated space

Part 2

The following two figures shows T2 using just 2 and 10 PCs. Although 2 PCs is not that much big bot the results are highly similar.

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