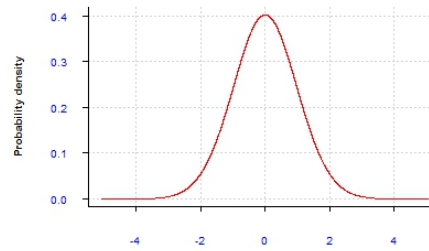


A Runs Test for the Hypothesis of Symmetry with one Sided Alternative

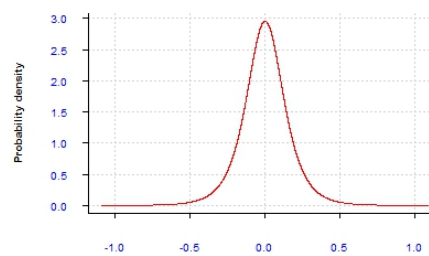
Supplementary 1. Cases of the $GLD(\lambda_1, \lambda_2, \lambda_3, \lambda_4)$ for Simulation.

	λ_1	λ_2	λ_3	λ_4
Case 1	0	0.197454	0.134915	0.134915
Case 2	0	-1	-0.08	-0.08
Case 3	0	-0.397912	-0.16	-0.16
Case 4	0	-1	-0.24	-0.24
Case 5	-0.116734	-0.351663	-0.13	-0.16
Case 6	0	-1	-0.1	-0.18
Case 7	3.586508	0.04306	0.025213	0.094029
Case 8	0	-1	-0.0075	-0.03
Case 9	0	1	1.4	0.25
Case 10	0	1	0.00007	0.1
Case 11	0	-1	-0.001	-0.13
Case 12	0	-1	-0.0001	-0.17

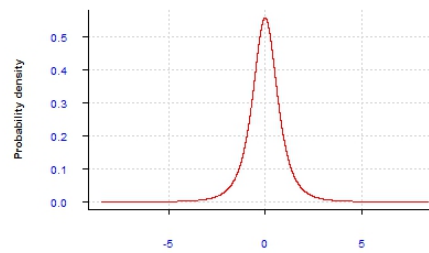
Case 1, GLD(0,0.197454,0.134915,0.134915)



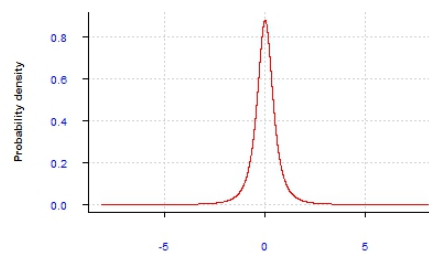
Case 2, GLD(0,-1,-0.08,-0.08)



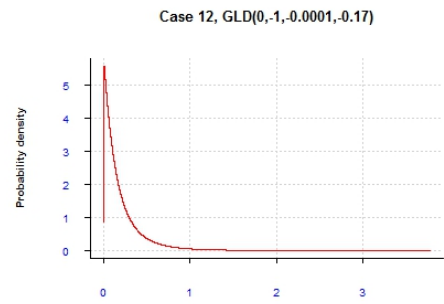
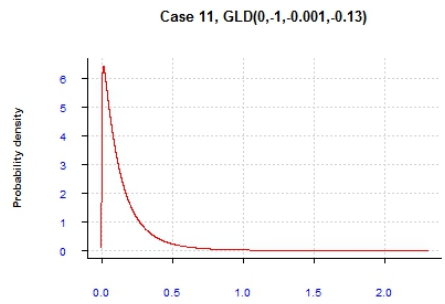
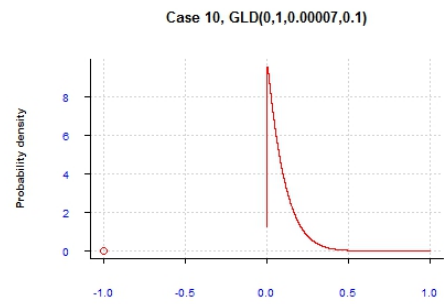
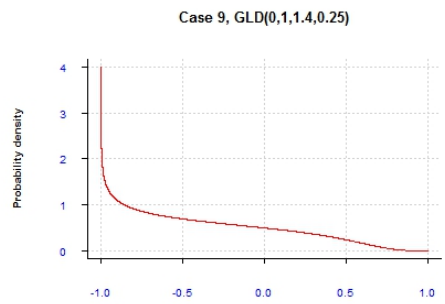
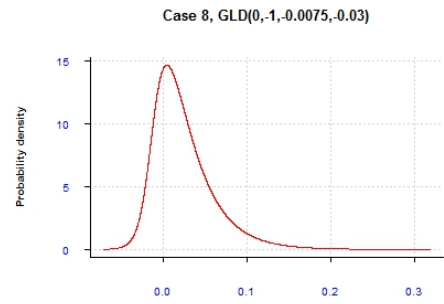
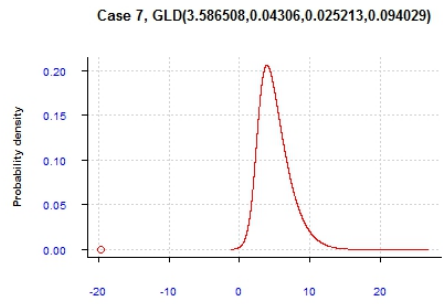
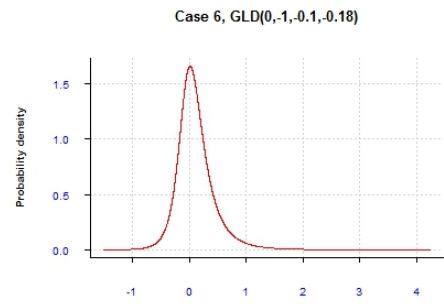
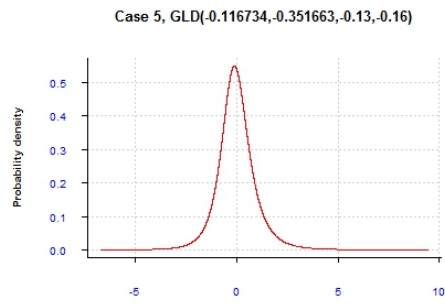
Case 3, GLD(0,-0.397912,-0.16,-0.16)



Case 4, GLD(0,-1,-0.24,-0.24)



Supplementary 2. GLD symmetric cases.



Supplementary 3. GLD asymmetric cases.

Supplementary 4. Empirical Power for $N = 30$ and $p = 0.8$.

	R_p	MGG	CM	M	tRW
Case 1	0.0623	0.0437	0.0420	0.0390	0.0580
Case 2	0.0417	0.0510	0.0367	0.0383	0.0450
Case 3	0.0390	0.0633	0.0363	0.0387	0.0450
Case 4	0.0377	0.0823	0.0413	0.0363	0.0493
Case 5	0.0793	0.1080	0.0657	0.0633	0.0690
Case 6	0.2170	0.2803	0.1980	0.1820	0.1447
Case 7	0.3847	0.3097	0.2653	0.2570	0.2140
Case 8	0.4967	0.4677	0.3877	0.3717	0.2637
Case 9	0.6720	0.3267	0.3347	0.2697	0.3370
Case 10	0.8877	0.7327	0.6880	0.6553	0.4860
Case 11	0.9473	0.8890	0.8357	0.7977	0.5700
Case 12	0.9527	0.9037	0.8503	0.8097	0.5840

Supplementary 5. Empirical Power $N = 50$ and $p = 0.9$.

	R_p	MGG	CM	M	tRW
Case 1	0.0673	0.0427	0.0400	0.0347	0.0663
Case 2	0.0477	0.0523	0.0373	0.0353	0.0583
Case 3	0.0493	0.0693	0.0440	0.0417	0.0563
Case 4	0.0523	0.0823	0.0430	0.0393	0.0533
Case 5	0.1283	0.1513	0.0973	0.0957	0.0987
Case 6	0.3690	0.4153	0.3173	0.3033	0.2153
Case 7	0.6593	0.4470	0.4167	0.3887	0.3133
Case 8	0.8120	0.6713	0.6103	0.5833	0.3940
Case 9	0.9283	0.4373	0.4560	0.3587	0.4573
Case 10	0.9970	0.8827	0.8663	0.8317	0.6623
Case 11	1.0000	0.9717	0.9597	0.9450	0.7517
Case 12	1.0000	0.9780	0.9673	0.9517	0.7653

Supplementary 6. Empirical Power $N = 100$ and $p = 0.9$.

	R_p	MGG	CM	M	tRW
Case 1	0.0637	0.0520	0.0510	0.0467	0.0813
Case 2	0.0503	0.0573	0.0427	0.0457	0.0643
Case 3	0.0513	0.0707	0.0477	0.0493	0.0640
Case 4	0.0430	0.0790	0.0463	0.0457	0.0583
Case 5	0.1680	0.2020	0.1510	0.1523	0.1267
Case 6	0.6143	0.6573	0.5637	0.5617	0.3310
Case 7	0.9100	0.7073	0.6863	0.6767	0.4877
Case 8	0.9757	0.9023	0.8783	0.8730	0.6180
Case 9	0.9910	0.6743	0.6940	0.5930	0.6623
Case 10	1.0000	0.9890	0.9860	0.9817	0.8790
Case 11	1.0000	0.9997	0.9993	0.9987	0.9507
Case 12	1.0000	1.0000	0.9997	0.9993	0.9507